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Satellite World

The Guide to International Cable & Satellite Television

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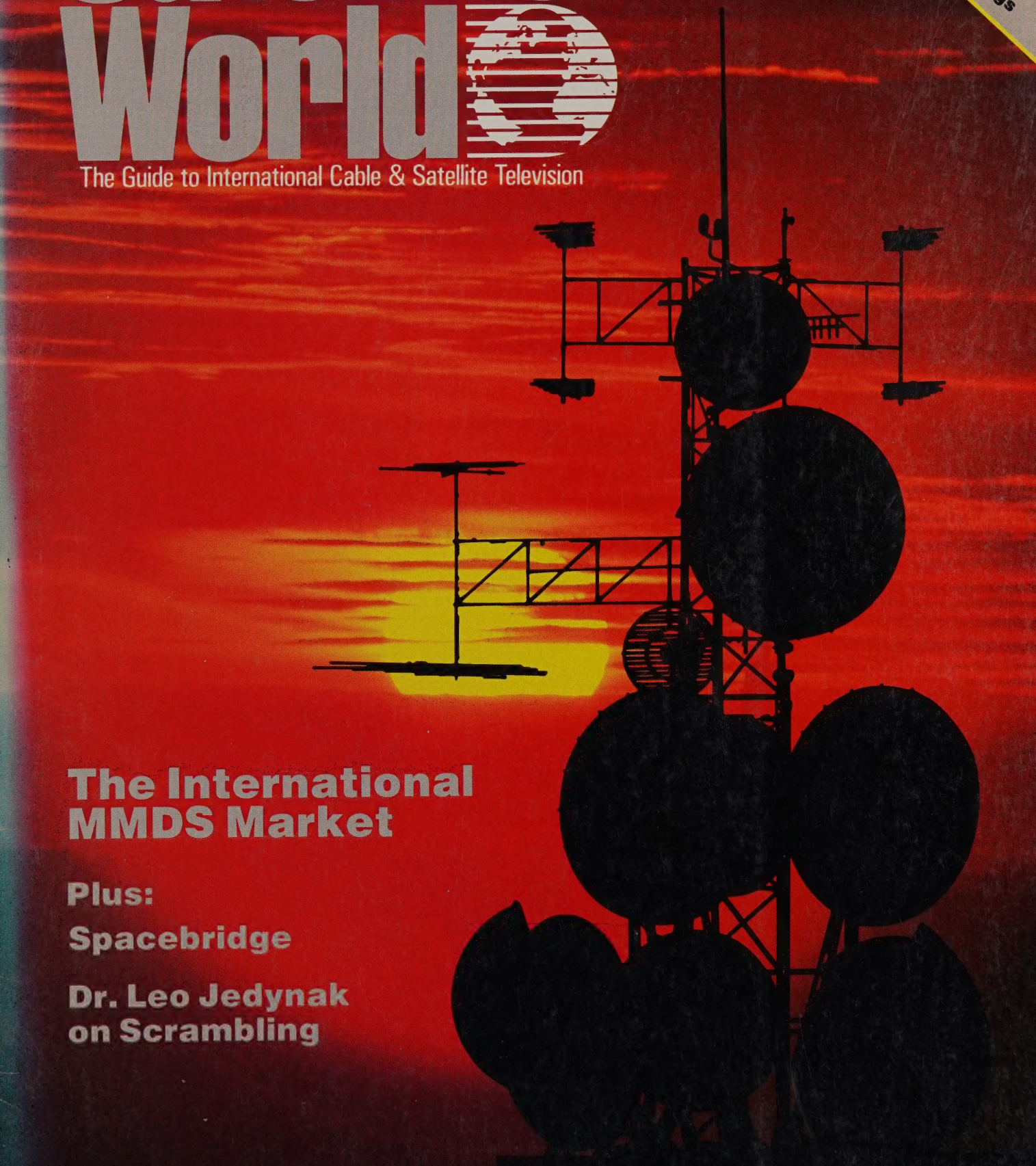
North American
Satellite Services Listings



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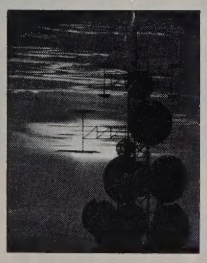

About the Cover: *Multichannel multipoint distribution system (MMDS) technology was originally developed in the United States for the over-the-air distribution of educational television programming. This same technology can now bring multichannel to villages around the world where cable distribution is impractical. Story on page 20. Cover art courtesy Hughes Microwave Products Division and David R. Frazier.*

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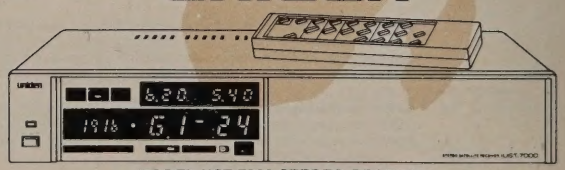

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Closing the Circle

Beginning with this issue: all the information on North American domestic satellites.

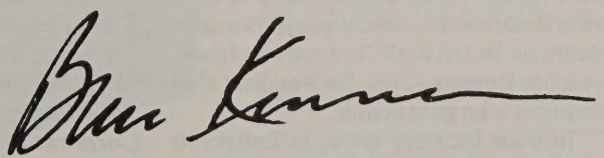
As new birds crowd the geostationary arc and existing ones change their loading plans to meet emerging market opportunities, it has become increasingly difficult to keep apprised of the many business and entertainment options offered by communications satellites around the world. This is critical for satellite professionals, whose business it is to know.

But with "transponder hopping" at epidemic proportions, even company spokesmen don't always know what their own services have been doing. One such spokesman for a major U.S. news network, for example, recently insisted that his service was not carried on a certain U.S. domestic Ku-band satellite about which *Satellite World* was attempting to obtain updated information; it was the spokesman who was updated. Extracting information on the movements of satellites from large, bureaucratic organizations such as Intelsat or Intersputnik can be even more frustrating.

Yet, now, more than ever, it has become vital that satellite professionals have specific, up-to-date information on satellites. Transponder brokers, hardware manufacturers, television programmers, home dish salesmen, business network users, cable operators, and—yes—company spokesmen share in common the need to know hard facts about satellites to make day-to-day decisions.

Keeping track of satellite launches, failures, shifts, reallocations, and other changes has become a task of gargantuan proportions at *Satellite World*. We feel, however, that the international satellite arena is becoming increasingly interrelated, and current, accurate information concerning the total picture is essential to take advantage of opportunities as they arise in various areas of the world.

Accordingly, we have added eight pages of information in the Americas Satellite Services section of this issue of *Satellite World* on specifications for all North American C- and Ku-band domestic satellites. This completes our information on the global geostationary communications satellite system, which includes all domestic, regional, and international satellite systems for ITU regions 1, 2, and 3. Now, keeping you current is our first priority.



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To The Editor

Signal Starved

We would very much appreciate it if you could help us locate dish antennas, receivers, and satellite accessories that would enable us to receive as many satellite transmissions as possible in Karachi, Pakistan. We are quite aware that while hundreds of programs are beamed down daily, no one location can see them all. However, our major interest is in the area of news transmitted by various wire services and other broadcast media. We hope that your professional expertise and advice will give us the necessary guidance.

Arshad A. Zuberi
Technical Director
Aslo Group of Companies
Karachi, Pakistan

Editor's Note: *With a 4.8-meter (16 ft) C-band system, you could receive the international news and sports feeds broadcast from the Intelsats located at 57 degrees and 60 degrees east longitude. In addition, you would receive a very strong signal from Gorizont 8, which broadcasts I and II Programma television from Moscow, and from Insat IB, which broadcasts TV India on C-band transponder 24.*

Targeting South America

I have just received the November issue of your very interesting magazine. The article entitled, "Target: South America" captured my attention and encouraged me to write this letter.

Several months ago, I took an interest in the field of satellite reception. However, the apparently complicated nature of the equipment and the fact that there was not a dedicated satellite configured for South America seemed to be definite disadvantages. Now, with the possibility that PanAmSat and Intelsat will be operating in South America in the second half of 1986, I have decided to enter this field on a commercial basis, either as a dealer for equipment exporting companies, or by operating a subscription service.

What size antenna will be required to receive PanAmSat's west spot beam, and is it possible to receive other satellites as well? Also, what additional equipment is needed?

Jaime Pedreros
Managing Director
Repimser Peruana S.A.
Lima, Peru

I am planning to install a TVRO system in my home, and also possibly to pursue a business in this field. I would like to know if you could help me on a couple of subjects.

I live in Argentina, where satellite TV at the consumer level has not even started. Not only is it currently prohibited by law, but there are also very few satellites from which one could receive signals. One of those satellites is Intelsat IVA F1, which, as you know, requires a very large antenna (6-7m) because of its global/hemispheric footprint. Another satellite presumably visible from Buenos Aires is Brazil's Brazilsat 1A, which projects a spot beam on Brazil itself, but only its fringe reaches Buenos Aires. So Brazilsat also requires a large antenna.

In your October issue, in Letters to the Editor, I read about the PanAmSat project that would link North and South America. I understand PanAmSat would operate on the Ku-band, which would require smaller dishes. This would make installing TVROs more economically feasible, so marketing possibilities would obviously grow. Could you please give me PanAmSat's address?

Richard Oxenford
Buenos Aires, Argentina

Editor's Note: *On December 24, 1985, Fred Landman, the president of PanAmSat, and Jim Cuddihy, the president of Cygnus Satellite Corporation, signed an agreement to "combine the use" of the orbital position at 45 degrees west for PanAmSat I and Cygnus II. This is a new position for PanAmSat I, advantageous because it allows the satellite to offer Ku-band capacity for the profitable telecommunications market between Europe and the United States. In fact, PanAmSat I, which had been scheduled to be positioned at 57 degrees west, will now devote* all *of its Ku-band capacity to U.S.-Europe communications. However, PanAmSat will still cover South America with four C-band spot beams, including one boresighted over Buenos Aires and one over Lima. With beam-center EIRPs in excess of 37 dBW, these strong C-band spot beams will allow individuals in both Lima and Buenos Aires to receive good pictures with 1.8-meter (6 ft) antennas. In addition, Intelsats VB F14 and F15, scheduled for launch in mid-1986, will carry C-band spot beams that will require 3.6-meter (12 ft) antennas for good reception in both these cities. PanAmSat's address is: Pan American Satellite Corporation (PanAmSat), 460 West 42nd Street, 4th Floor, New York, NY 10036, U.S.A.*

Scrambling Down Under

Besides Aussat I, which is a Ku-band satellite scrambled with B-MAC, we watch, with much interest, the AFRTS programming on the Intelsat at 179

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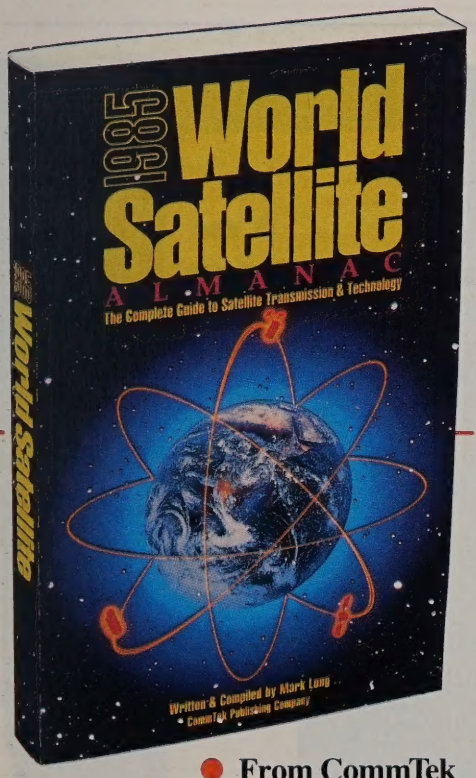

You are invited to examine the first edition of the only comprehensive technical resource for the international satellite industry.

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Information on each satellite includes background on the owner/operators, subcontracts and services. Satellite at a Glance Charts supply orbital assignments, projected life and vital statistics on the communications payload and the spacecraft itself.

Data on polarization, up- and downlink frequencies, coverage areas and more are contained in Satellite Channel Assignment Charts. And Footprint Maps, plus C- and Ku-band reception charts, will enable readers to determine the optimum mix of equipment for reception in their location.

The chapter explaining how to use the World Satellite Almanac appears in English, French, German, Spanish and Portuguese for professionals around the world.

In addition to sections devoted to worldwide video, voice and data transmission techniques, Intelsat non-video standards, Inmarsat and more, the 1985 Almanac carries full descriptions of the technical parameters and program services to be carried by new systems planned for 1985.

Send for your copy today! And see for yourself how the 1985 World Satellite Almanac will answer your questions, aid your long-range planning and help you to identify new opportunities.

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degrees east longitude.

A rumour has it that AFRTS will be scrambled or transferred to another satellite. Can you advise me if equipment is available to continue watching AFRTS?

Also, Gorizont has a satellite with a footprint that covers Sydney. Are there any other foreign satellites covering Sydney with regular programming? And does Gorizont transmit in SECAM on C-band?

And last, is there currently available a C-band/Ku-band system with B-MAC compatibility?

Jacob Keness
Sydney, Australia

Editor's Note: *By the time you read this, American Forces Radio and Television Service (AFRTS) will have moved to Intelsat V F8, the satellite that replaced Intelsat IVA F3 at 179 degrees east. With an EIRP level of about 29 dBW in Sydney, Intelsat V F8 is a few dB stronger than Intelsat IVA F3. However, it is true that AFRTS intends to scramble its service by the third quarter of 1986. At this time, the service does not intend to market descrambling equipment to the general public.*

Gorizont satellites do broadcast services in the SECAM standard. In addition, services broadcast on hemispheric beams use sound-in-sync techniques for audio that requires a special decoder.

Aside from Russian programming, the only other foreign programming available via satellite in Sydney would be from Palapa B1 at 108 degrees east. However, Sydney is far removed from the intended signal coverage area of this satellite, so reception would require a large antenna, perhaps as large as 10 meters (32.5 ft).

For more information about dual C- and Ku-band systems integrated with B-MAC decoders, contact: Lindsay Jorgensen, HiTron Pty. Limited, P.O. Box 539, Goroka, E.P.H., Papua, New Guinea.

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C-band Margin-above-threshold Chart for 4-, 5-, 6-, 7.5- and 10-Meter Aperture Antenna Earth Stations

ANTENNA SIZE	13 FEET			16 FEET			20 FEET			25 FEET			33 FEET		
LNA N.T.	120°	90°	60°	120°	90°	60°	120°	90°	60°	120°	90°	60°	120°	90°	60°
EIRP LEVEL															
34 dBW	+2.4	+3.4	+4.7	+4.9	+5.9	+7.2	+6.9	+7.9	+9.2	+8.8	+9.8	+11.8	+11.2	+12.2	+13.5
33 dBW	+1.4	+2.4	+3.7	+3.9	+4.9	+6.2	+5.9	+6.9	+8.2	+7.8	+8.8	+10.1	+10.2	+11.2	+12.5
32 dBW	+0.4	+1.4	+2.7	+2.9	+3.9	+5.2	+4.9	+5.9	+7.2	+6.8	+7.8	+ 9.1	+ 9.2	+10.2	+11.5
31 dBW	−0.6	+0.4	+1.7	+1.9	+2.9	+4.2	+3.9	+4.9	+6.2	+5.8	+6.8	+ 8.1	+ 8.2	+ 9.2	+10.5
30 dBW	−1.6	−0.4	+0.7	+0.9	+1.9	+3.2	+2.9	+3.9	+5.2	+4.8	+5.8	+ 7.1	+ 7.2	+ 8.2	+ 9.5
29 dBW	−2.6	−1.4	−0.3	−0.1	+0.9	+2.2	+1.9	+2.9	+4.2	+3.8	+4.8	+ 6.1	+ 6.2	+ 7.2	+ 8.5
28 dBW	−3.6	−2.4	−1.3	−1.1	−0.1	+1.2	+0.9	+1.9	+3.2	+2.8	+3.8	+ 5.1	+ 5.2	+ 6.2	+ 7.5
27 dBW	−4.6	−3.4	−2.3	−2.1	−1.1	+0.2	−0.1	+0.9	+2.2	+1.8	+2.8	+ 4.1	+ 4.2	+ 5.2	+ 6.5
26 dBW	−5.6	−4.4	−3.3	−3.1	−2.1	−0.8	−1.1	−0.1	+1.2	+0.8	+1.8	+ 3.1	+ 3.2	+ 4.2	+ 5.5
25 dBW	−6.6	−5.4	−4.3	−4.1	−3.1	−1.8	−2.1	−1.1	+0.2	−0.2	+0.8	+ 2.1	+ 2.2	+ 3.2	+ 4.5
24 dBW	−7.6	−6.4	−5.3	−5.1	−4.1	−2.8	−3.1	−2.1	−0.8	−1.2	−0.2	+ 1.1	+ 1.2	+ 2.2	+ 3.5
23 dBW		−7.4	−6.3	−6.1	−5.1	−3.8	−4.1	−3.1	−1.8	−2.2	−1.2	+ 0.1	+ 0.2	+ 1.2	+ 2.5
22 dBW			−7.3	−7.1	−6.1	−4.8	−5.1	−4.1	−2.8	−3.2	−2.2	− 0.9	− 0.8	+ 0.2	+ 1.5
21 dBW					−7.1	−5.8	−6.1	−5.1	−3.8	−4.2	−3.2	− 1.9	− 1.8	− 0.8	+ 0.5
20 dBW						−6.8	−7.1	−6.1	−4.8	−5.2	−4.2	− 2.9	− 2.8	− 1.8	− 0.5
19 dBW								−7.1	−5.8	−6.2	−5.2	− 3.9	− 3.8	− 2.8	− 1.5
18 dBW									−6.8	−7.2	−6.2	− 4.9	− 4.8	− 3.8	− 2.5
17 dBW											−7.2	− 5.9	− 5.8	− 4.8	− 3.5

International Satellite Frequency Chart

WH = Western Hemisphere EH = Eastern Hemisphere WZ = Western Zone EZ = Eastern Zone

U.S. Domestic		Intelsat IV & IVA		Intelsat V			Gorizont/Raduga	
Tr. #	Frequency	Tr. #	Frequency	Tr. #	Beam	Frequency	Tr. #	Frequency
							6 [-1]	3675
1	3720	1 [1]	3725				8 [1]	3725
2	3740			11 [1-3] 21 [1-3] 41 [1-3]	WH EH WZ	3742.5		
				51 [1-3]	EZ			
3	3760	2 [3]	3765					
4	3780						8 [4]	3775
5	3800	3 [5]	3805					
6	3820			12 [5-7] 22 [5-7]	WH EH	3825	9 [6]	3825
7	3840	4 [7]	3845	42 [5-7] 52 [5-7]	WZ EZ			
8	3860							
9	3880	5 [9]	3885				10 [9]	3875
10	3900			13 [9-11] 23 [9-11] 43 [9-11] 53 [9-11]	WH EH WZ EZ	3905		
11	3920	6 [11]	3925				11 [11]	3925
12	3940							
13	3960							
14	3980	7 [14]	3975					
15	4000			14 [14-16] 24 [14-16] 34 [14-16] 44 [14-16] 54 [14-16]	WH EH G WZ EZ	3995		
16	4020	8 [16]	4015					
17	4040							
18	4060	9 [18]	4055	15 [18] 25 [18] 35 [18]	WH EH G	4055		
19	4080							
20	4100	10 [20]	4095	36 [20]	G	4095		
21	4120							
22	4140	11 [22]	4135	37 [22]	G	4135		
23	4160							
24	4180	12 [24]	4175	38 [24]	G	4177.5		

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The COM-66T commercial receiver features excellent threshold performance and is compatible with AVCOM's BDC-60 block downconverter. The result is a double conversion system that offers high stability and can be used with any brand and degree LNA. Modular circuit packaging produces a compact and highly reliable receiver in 3½" standard rack mount configuration. The COM-66T may be ordered with optional threshold peaking and dual IF filters for receiving international type transmissions.

The SCPC-100 offers a versatile approach for receiving specific frequencies of single channel per carrier transmissions. The SCPC-100 system can solve the difficult problem of receiving audio which is transmitted separately from the video by international type satellites. Applications are many and varied.

Check with us. Different needs require different receivers. So let us know what you need, then we can recommend the AVCOM receiver that's best for you.

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INTERNATIONAL SATELLITE RECEIVERS

By Jonathan Miller
Washington, D.C.

Expansion and Contraction

While Europe liberalizes its telecommunications policies, U.S. firms consolidate.

I recently stopped at the Tara Hotel in London to deliver my annual harangue to European satellite communicators at the Satellite Communications conference. Regular readers of this space will be familiar with my main themes: That Europe has paid too much attention to high-powered DBS, and not enough to developing medium-powered satellite services, and that European governments and traditions remain an obstacle to the development of a broad range of economically successful satellite services.

Normally, this approach is enough to spark a vigorous discussion, complete with outraged television broadcasters and offended post, telephone, and telegraph (PTT) monopolists forcefully suggesting that Miller return to America with his subversive ideas. Not, however, this time. Instead, I discovered that in the past 12 months, most sensible television broadcasters in Europe have come to agree that high-powered DBS is too expensive. Even the PTT men are mellowing. Competition, they are discovering, may not be so awful. (They have noted with interest that in Britain the salaries of top telecommunications managers have shot up, as British Telecom strives to keep its executive deck intact for its competitive struggle with Mercury Communications.)

At the Tara, the only man who gave me a real argument was a bureaucrat from the German PTT. This organization, properly known as the Bundespost, is well known as the most atavistic of them all. It will be interesting to see if he, and it, have by next year seen the light.

Television, á la Carte

When, in Paris a few days after the conference, I checked in at the Meridien Hotel, my Parisian friend was singularly unimpressed at my choice. The Meridien is remarkable neither for native French charm nor grand European luxury. Indeed, it has all the character of a suburban Washington Holiday Inn. But the Meridien does have special features of interest. It has telephones that work (not always easy to find in France) and the world's best satellite television system.

A few months ago, I stayed here overnight en route from London to French Guiana. Landing at the Meridien almost by accident, I was interested to see a dish on the roof, and to find the television set in my room offering Sky Channel from London along with the three local television stations.

Now, in Paris for a couple of days of meetings, I have returned to the Meridien to find eight satellite dishes on the roof and 19 channels of television available in my room, originating from Britain, Italy, Germany, Holland, the United States, the Soviet Union, and Saudi Arabia.

As far as the French authorities are concerned, what is happening at the Meridien is an "experiment." But the omens are good that the Meridien experiment will be allowed to continue, and that other hotels soon will follow its example.

By far the most interesting program I watched at the Meridien was the one-hour evening news from Moscow, called *Vremya* (Time). My Russian leaves much to be desired, but was nevertheless adequate to grasp that the Russian program's references to America were usually less than flattering. What was impressive, however, was the relatively high degree of technical skill with which the program was put together.

The eight dishes on the roof of the Meridien are living proof that television is becoming more of an international form of mass communication. The lesson for the West is that our form of television cannot be assumed to enjoy an unchallengeable technical superiority. The Russians are working to close the television gap.

Farewell, Nipper

The acquisition of RCA by GE has been carefully packaged to look like a "great benefit to American competitiveness." The phrase sounds as if it was written in George Orwell's Ministry of Truth. In the manufacturing of space systems, of course, a buyout is just the opposite. From Princeton, New Jersey, RCA Astro-Electronics Division has carved itself a place as one of the world's most innovative constructors of space systems, especially communications satellites. In Valley Forge, Pennsylvania, GE has a space systems division of its own, currently turning out military communications satellites. How can putting these two organizations together be anything but harmful for the people who buy space systems? When NASA, the Defense Department, or private customers put out a request for proposals, the merger will only ensure that there's one fewer proposal.

It is, of course, too much to hope that the Justice Department will seek to undo this announced merger, and especially implausible because, to be frank, the space systems divisions of these two great companies are hardly significant in the overall multibillion-dollar scheme of things. It is, however, no less a shame that there will now be one less satellite constructor in the world, and it will be a special shame that GE will start calling the shots at Astro-Electronics, which has certainly shown no sign that it is in need of better management.

An Open Letter To Owners Of Home Satellite Systems

Dear Home Satellite System Owner:

By now, most of you are aware that HBO® and Cinemax® satellite feeds are scrambled full time.

Unfortunately, along with the news of HBO's scrambling plans has come a flood of misinformation about these plans, as well as about the availability of HBO and Cinemax signals for home satellite system owners. Understandably, many of you have expressed concern over these issues. We would like to set the record straight on some of these issues so that you may have the information you need to make the choices you will be faced with when scrambling occurs.

First, why are we scrambling?

An increasing number of commercial enterprises — including hotels, motels, bars and apartment buildings — are picking up our signals without permission and without charge. This is a violation of the copyrights of artists and businesses with whom we have contractual agreements to provide programming. Signal scrambling is the best way to protect these copyrights. At HBO, we are careful to distinguish between the legitimate reception of our signals by individual satellite system owners and theft by commercial establishments who may be profiting from our signal. For this reason, we have established a plan to make HBO and Cinemax available to individual satellite system owners.

How can you continue to receive HBO and Cinemax after scrambling?

To continue to receive HBO and Cinemax, you can contact a TVRO dealer or local cable company to purchase a descrambler that uses the M/A-COM VideoCipher II™ technology. You can then purchase a monthly subscription for the programming services you wish to receive. You can do this by contacting a local cable company or, if you prefer, you may purchase a subscription directly from HBO. Please bear in mind that owning a descrambler box alone will not allow you to receive HBO and Cinemax. It simply gives you the capability of receiving unscrambled signals from a growing number of satellite programming services. After you subscribe to HBO and Cinemax, your descrambler will be activated to receive our services.

How much will it cost to subscribe to HBO and Cinemax?

You may subscribe to HBO and Cinemax through a local cable company or through HBO directly. If you subscribe through HBO directly, the monthly prices will be $12.95 for HBO, $12.95 for Cinemax, or $19.95 for the HBO/Cinemax Combo. These prices include our monthly program guide. Prices charged by local cable companies will vary from one company to another. We encourage home satellite system owners to check prices at their local cable companies before contacting HBO for a subscription.

We realize that this letter answers only some of the questions you may have about HBO's scrambling plans. If you would like more information, please call our Scrambling Hotline at (212) 302-6242 during business hours, Monday through Friday, 9 a.m.—5 p.m., Eastern Time. Or, if you prefer, write us and receive *Questions and Answers About Scrambling*, our informational brochure for home satellite system owners. Address your inquiries to:

Home Box Office, Inc.
Direct Broadcast Department
1100 Avenue of the Americas
New York, New York 10036

We look forward to hearing from you.

HBO®
cinemax®

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NEWS

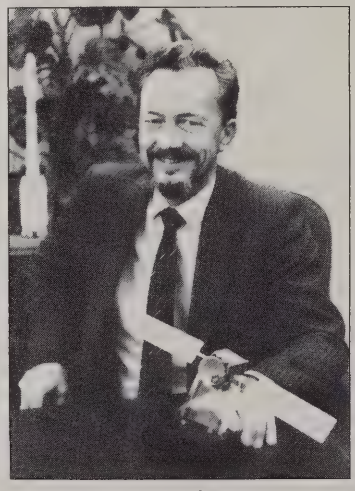
AT&T & Philips Telecommunications B.V., a joint venture of U.S.-based American Telephone & Telegraph Co. (AT&T) and N.V. Philips of the Netherlands, has received tentative approval—"subject to further technical and financial arrangements"—from the French Cabinet to sell digital telephone switches in France. Under the proposed arrangement, AT&T & Philips could get as much as $130 million, or 16 percent, of the French post and telecommunications (PTT) agency's annual switch purchases. According to the terms of the complex arrangement, AT&T would also help France's state-owned Cie. Generale d'Electricite (CGE) sell its switches in the United States, and AT&T & Philips and CGE would be involved in a microwave transmission equipment manufacturing venture. The microwave equipment would be purchased by AT&T.

An onboard computer automatically aborted the December 1985 launch of space shuttle *Columbia* four seconds before ignition and 14 seconds before liftoff, after it reportedly detected a defective thrust-directing hydraulic power unit in one of the shuttle's solid fuel boosters. A backup unit was functioning normally; shuttle computers, however, are programmed to scrub launches if any mechanical problems are detected.

Earlier in 1985, a scientific shuttle mission was "aborted" to an unusually low orbit by ground control because one of four shuttle launch-assist engines failed a few minutes after liftoff. December's computer-aborted mission, which had previously been delayed by slow ground crew preparations and foul weather, was rescheduled for January 1986.

Columbia's disappointed crew included Representative William Nelson, the second U.S. congressman scheduled for a space junket. Wilson is the chairman of a House subcommittee that oversees space matters. He represents a district that includes the Kennedy Space Center facility. RCA's 16-transponder Ku-band Satcom K1, which would have been stationed at 85 degrees west, was scheduled for deployment; Satcom K2, which was PAM-D2 deployed without insurance in November 1985, is already at 81 degrees west (see "World Watch," November 1985).

Columbia, the first flagship of the U.S. National Aeronautics and Space Administration's (NASA) four-shuttle spacefleet, flew its maiden mission in April 1981. After 6 missions, the shuttle and its fatigued ceramic tiles were drydocked for 18 months. Electronic and mechanical modifications and repairs included the removal of *Columbia's* heavy ejection seats. The safety devices, no longer considered crucial, were replaced with the lighter seats already installed in the newer shuttles.



Dr. Pierre Meyrat of SES

Societe Europeene des Satellites (SES) appointed Dr. Pierre Meyrat as its general manager in January 1986. Before joining SES, Meyrat was managing director of Teleclub AG (Switzerland) and Teleclub GMBH (West Germany). The newly formed SES executive committee is chaired by Viscount Etienne Davignon; Corneille Bruck, Daniel Johannesson, Count Roland de Kergorlay, and Raymond Kirsch are committee members. SES plans to launch a 16-transponder medium-power Ku-band direct broadcast satellite in the spring of 1987 using an Arianespace expendable launch vehicle (ELV).

British General Electric Co. (GEC), the U.K.'s largest electrical concern, offered to buy Plessey Co., one of GEC's main competitors, for a £1.28 billion ($1.79 billion) package of securities and cash in December 1985. GEC also said it planned to mail information to Plessey stockholders that would explain the terms of its bid. Plessey countered by offering to buy GEC's digital telephone switch manufacturing division. U.K.-based GEC is not related to U.S.-based General Electric Co. (GE).

£6.3 billion ($8.85 billion) of sales revenue was reported by GEC for the fiscal year that ended in March 1985; Plessey reported £1.5 billion ($2.1 billion) for the same period. Neither company has been doing as well since then. According to Plessey's board of directors, GEC's rejected takeover bid was devoid of "commercial logic." The two companies often bid on the same projects.

British Telecom PLC (BT), privatized in 1985, has purchased digital switches from Plessey and GEC. "To us, there is industrial logic in having one U.K. supplier," said F. Douglas Perryman, BT's corporate finance director. "But," he added, "our position is complete neutrality." Last year, GEC said it was forced to lay off 600 workers that had been building digital switches for BT because BT was buying more imported hardware.

GEC said a merger with Plessey would allow the two companies to compete more effectively in the international telecommunications marketplace. Plessey and U.S.-based Scientific Atlanta (S-A) already enjoy a long-standing working relationship. S-A and Plessey's Australian division are jointly marketing B-MAC transmission and reception hardware for use with Australia's Ku-band Aussat system. A joint Plessey and S-A switched-star technology research and development venture based in the United Kingdom was amiably closed down late in 1984 after the U.K. market for the two-way broadband cable switches failed to develop as expected.

A picture-telephone system developed by two Massachusetts Institute of Technology (MIT) graduate students is now being evaluated by a British telecommunications expert formerly with the U.S.-based Bell Communications Research facility. The PicTel Corp. system employs a sophisticated codec (encoder/decoder) that transmits full color and motion over a telephone line by ignoring the parts of an image that do not change from scan to scan.

T1-rated copper wire telephone lines can handle 50 kb/s; television signals normally require 20,000 times that capacity. Satellite-relayed transmissions using PicTel Corp. technology would only require narrow single-channel-per-carrier (SCPC) bandwidths.

Thomson-CSF, a French electronics company, and the Tactical Systems Division of U.S.-based GTE Corp.'s Government Systems Unit have been awarded a $4.3 billion joint contract by the U.S. Army for a secure mobile telecommunications system. Before the size of the contract was disclosed, GTE had said that it would hire an additional 1,000 workers and subcontract some of the work to as many as 30 companies.

Two Eutelsat-IF1 transponders lost about 1 dBW of power over the last three months of 1985. The troubled transponders are leased to FilmNet/ATN (Belgium west spot transponder 9) and Sky Channel (U.K. west spot transponder 6).

F1 at 13 degrees west was built by the Space & Communications Division of British Aerospace's Dynamics Group. Launched in June 1983, its 12 transponders were expected to lose about 3 dBW of power over the satellite's seven-year life expectancy, according to the European Telecommunications Satellite Organization (Eutelsat).

The power drop may not be mechanically significant, according to one European engineer. Power levels already vary from transponder to transponder of F1 and slight fluctuations could be produced by shifts in the overall load handled by the satellite. Doubts about the basic Eutelsat I design and the September 1985 loss of F3, however, have present and future Eutelsat transponder tenants worried about the availability of backup transponders. Eutelsat has reportedly ordered a sixth Eutelsat I, a move that had been opposed by some member-nation post and telecommunication agencies (PTTs).

F1's 20-watt traveling wave tube amplifiers (TWTAs) were built by AEG-Telefunken. The West German company is supplying 230-watt and 260-watt direct broadcast satellite (DBS) TWTAs for West Germany's TVSat and France's TDF-1. Both DBS satellites are scheduled for 1986 launches.

Ford Aerospace & Communications Corp., a subsidiary of the U.S.-based Ford Motor Co., was awarded a $203 million three-satellite construction contract by the U.S. National Aeronautics and Space Administration (NASA) in December 1985. The three advanced satellites will be used in the U.S. Geostationary Operational Environmental Satellite (GOES) program. The contract also included a $73 million option for two additional satellites; the total price of the five-satellite package was scheduled to rise to $385 million if President Reagan did not allow NASA and the U.S. National Oceanic and Atmospheric Admistration (NOAA) to exercise the two-satellite option in January 1986.

The weather satellites, which are being sold to NOAA, will incorporate new cloud and temperature detection features and use a three-axis stabilization system that will deliver improved short-range weather forecasts. GOES-1, 2, and 3 were built by Ford. The contract for the GOES-4 through 8 spin-stabilized spacecraft was awarded to Hughes Aircraft Co.; two of those satellites are still being assembled. GOES-9, the first satellite in the new Ford-built series, is scheduled for PAM-D shuttle deployment in October 1989.

The United States was left with one operating geostationary weather satellite, GOES-6, and two NOAA-series polar-orbiting weather satellites after a backup optical encoder light bulb failed on GOES-5 in November 1984. NOAA-8, another polar-orbiting satellite, was launched a few months later.

GOES-7 and GOES-8 are scheduled for Delta expendable launch vehicle (ELV) launches in May 1986 and August 1986 respectively. Neither satellite will launch on time, however, according to a source involved in the final satellite assembly and testing process. Parts that should have arrived months before still hadn't arrived at press time, and problems with GOES-7's faulty visible atmospheric sounder (VAS) and visible and infrared spin scanning radiometer (VISSR) unit still had to be diagnosed and remedied.

The British government began selling off 102.5 million shares representing its 22.7-percent interest in U.K.-based Cable & Wireless PLC in December 1985. The government's self-imposed divestiture was aided by an Independent Television (ITV) advertising campaign modeled after the campaign mounted in November 1984 when the Thatcher administration decided to privatize its 50.2-percent share of British Telecom PLC (BT). The television license fee-supported British Broadcasting Corp. (BBC) is not allowed to carry advertising; the two BBC channels received no revenue from either campaign.

The government's Cable & Wireless shares and another 56.4 million new shares offered by Cable & Wireless at the same time were worth an estimated £986 million ($1.38 billion) when they first became available. Cable & Wireless is the only company other than BT that is licensed to provide plain old telephone service (POTS) in the United Kingdom.

Three of the four available TDF-1A broadcast channels had been authorized by the French government at press time:

- An eight-year lease reportedly grants left-wing U.K. media magnate Robert Maxwell, a former Labour Party U.K. Minister of Parliament, the sole right to broadcast English-language programming on the satellite. Maxwell will pay $7.8 million the first year to lease one direct broadcast satellite (DBS) transponder; the annual rate will rise as his audience increases. Maxwell says his information and entertainment channel will be totally advertising supported. The Socialist French government chose Maxwell instead of the conservative Rupert Murdoch, another applicant, for political reasons, according to some observers.
- A second transponder will be leased by a partnership involving Italian television tsar Silvio Burlusconi (40 percent), and two French investors guaranteeing non-foreign control of the service: Jerome Seydoux (40 percent) and Christophe Riboud (20 percent). Burlusconi, a friend of Italian Premier Bettino Craxi, is generally considered a political leftist in spite of his entrepreneurial crusades.

The Franco-Italian DBS service is also the first of two new national television networks authorized by the French government. The new French network, La Cinq, could begin terrestrial broadcasts as as early as this month.

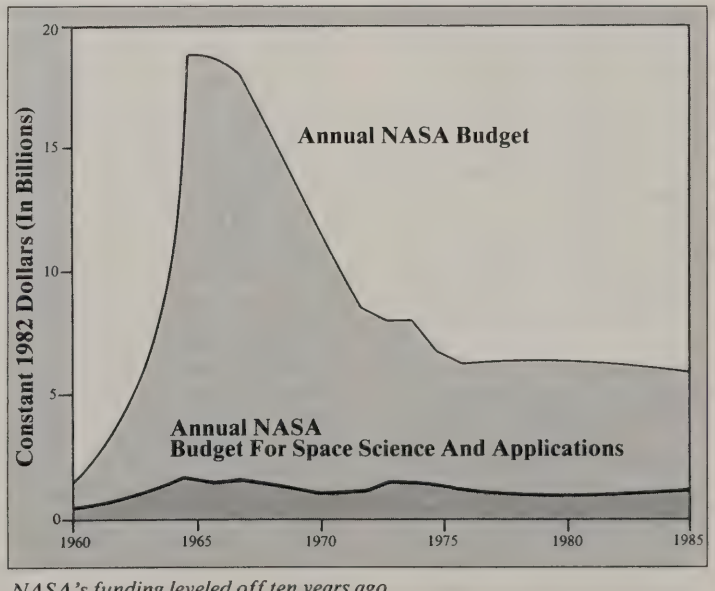
- A third TDF-1 transponder will be used to transmit a French cultural service overseen by French Minister of Culture Pierre Desgraupes.
- STV (Satellite Television), a French programming service that wants to become the second new French terrestrial network, is considered by many to be the most likely service to lease the remaining high-power transponder. At press time, however, STV was scheduled to begin using a 20-watt Ku-band transponder—number 3 being the most likely—on France's Telecom F2 (aka Telcom 1B) at 5 degrees west. Advertising-supported STV will obtain some programming from Rede Globo of Brazil and Music Box of the United Kingdom. The French post and telecommunications authority (PTT) denied STV the use of a Telecom transponder in late 1985 after Jean-Marc Berger, head of STV and the owner of a Paris night club, first announced that his new service was going to switch on (see "World Watch," November 1985).

Many U.S. scientists whose research projects have been delayed or cancelled because of shuttle project cost overruns say the international *Columbus* space station would siphon off even more money from future remote-controlled spacecraft projects. In a recently published article (*Scientific American,* January 1986), Dr. James A. Van Allen argues the case for *not* funding the $8 billion permanently manned project: "The acceptance of such grandiose proposals by otherwise rational individuals stems from the mystique of space flight, as nurtured over many centuries by early writers of science fiction and their present-day counterparts." Arthur C. Clarke, one such writer, suggested that telecommunications satellites be placed in geosynchronous orbits some 40 years ago.

Why is Van Allen grinding his ax? The U.S. National Aeronautics and Space Administration (NASA) has annually received about the same allocation since the Apollo moon mission funding from the 1960s dried up. The United States, for example, cancelled its Comet Halley mission; the Union of Soviet Socialist Republics (with 2), Japan (2), and the European Space Agency (1), on the other hand, launched five.

The result of steady-state NASA funding, according to Van Allen, is a kind of zero-sum budgeting process that unfairly pits high-cost manned missions like the U.S. shuttle Space Transportation System (STS) and the *Columbus* space platform against less glamorous alternatives: broad-spectrum Earth observation platforms, deep-space exploratory probes, and Clarke Belt telecommunications satellites. Van Allen confirmed the existence of the radiation belt that bears his name with data collected in 1958 by Explorer 1.

The Defense Contract Audit Agency of the U.S. Department of Defense (DoD) has subpoenaed internal records of Ford Motor Co. and its subsidiary, Ford Aerospace & Communica-



NASA's funding leveled off ten years ago.

tions Corp. The supoena seeks 36 internal reports from as far back as 1981, including audits of Ford Aerospace's aeronautical division, satellite development laboratories, and space mission operations. Ford charged $1.2 billion for DoD work done during the fiscal year ending in September 1984.

Westinghouse Electric Corp., which refused a similar DoD request, lost its federal court battle in August 1985; the case is on appeal. Ford was the prime contractor and Westinghouse was a subcontractor on the ill-fated Sgt. York antiaircraft gun project.

James M. Beggs, head of the U.S. National Aeronautics and Space Administration (NASA), took an indefinite leave of absence after he was named in a December 1985 federal grand jury indictment. Beggs, formerly an executive vice president with General Dynamics Corp.; three General Dynamics officials; and General Dynamics itself were charged with conspiring to defraud the U.S. government of $3.2 million under a U.S. Army Sgt. York antiaircraft gun contract. Beggs, who became head of NASA in August 1981, said he would be vindicated.

Fraudulent U.S. government contract charges became a major legal and political issue in 1985. The amount the U.S. Congress will budget for the research and development (R&D) phase of the international *Columbus* space station project and other NASA undertakings could be adversely affected if NASA officials were linked to any U.S. companies found guilty of fraudulent billing practices.

William Graham, formerly with R&D Associates, another U.S. defense contractor, had served as Beggs's deputy for only one week before Beggs stepped down and the new assistant was named NASA's acting administrator. Philip Culbertson, a 20-year NASA veteran, was appointed to the newly created post of general manager to act as Graham's unofficial advisor.

Arianespace, the European expendable launch vehicle (ELV) consortium, plans to set up a wholly owned launch insurance subsidiary, Societe de Reassurance des Risques Spatiux (SRRS), to provide compensation or free relaunch services for backup satellites in case of future Ariane ELV mishaps.

Earth stations in Papua New Guinea can receive three new Aussat-delivered audio services.

ECS-3, which would have been designated Eutelsat-IF1 once it was operational, and GTE's Spacenet III were lost in September 1985 as a result of third-stage Ariane ELV complications.

SRRS will be capitalized at about $4 million and will cover itself on the reinsurance market, according to Arianespace officials. While testifying before a U.S. Senate Space Subcommittee hearing on space insurance in November 1985, Jean-Claude Bouillot of the Centre National D'Etudes Spatiales (CNES, the French space agency) indicated that SRRS losses would not be covered by the French government. France, however, may be forced to insure Television par Satellite's TDF-1A direct broadcast satellite, a high-power bird currently scheduled to launch later this year.

Arianespace customers that have already contracted for launches can buy the relaunch insurance for an 11-percent premium, and new customers will be able include insurance payments in their launch reservation installments, according to an Arianespace spokeswoman. Launching a single PAM-D-class satellite as part of an Ariane 2 dual-satellite launch cost between $25 million and $30 million in 1985. Ariane 2 and 3 ELVs will be used for most of the Arianespace satellite launches scheduled for 1986.

The U.S. National Aeronautics and Space Admistration (NASA) has already promised free relaunch services for shuttle-deployed satellites that fail. Satellite owners, however, would still have to pay NASA for rescues and pay satellite suppliers for repairs before they could take advantage of NASA's largess.

The two C-band Australian Broadcasting Company feeds formerly carried by the Intelsat at 179 degrees east shut down on December 18, 1985, after a month of parallel transmission tests. The ABC feeds are now converted to the encrypted B-MAC transmission standard and relayed by Australia's Ku-band Aussat 1 at 156 degrees east. The official start-up of the Aussat system was scheduled for Australia Day on January 26, 1986. Transponder-use plans, however, were still unclear at press time. Plessey-built B-MAC standard TVRO systems reportedly cost about $2,000 Australian (U.S.$1,400).

Late in December, HiTron Pty. Ltd., of Port Moresby, Papua New Guinea—one of the neighbor nation's authorized Aussat receiver dealers—told *Satellite World* that it receives one of the ABC feeds on transponder 14, a northeastern (NE) beam. Three Australian radio services can be accessed after a receiver-generated menu appears on the viewer's television screen: Radio National, Radio 1, and the Fine Music Channel. A locally manufactured 1.8-meter solid dish and a 5-meter (16-foot) Paraclipse mesh antenna both produced an acceptable signal at the same Port Moresby site, according to HiTron.

President Francois Mitterrand's Socialist coalition will be stripped of its current powers after France's 1986 national elections, according to many political analysts. That, to many, explains the current government's relatively swift enacting of the liberal recommendations incorporated in the government-commissioned national media policy report written by Jacques Bredin, a Parisian attorney, and released late in 1985. Critics claiming that the recent TDF-1A direct broadcast satellite (DBS) channel-allocation decisions were made for political reasons also point to applicants who have so far been denied French DBS leases or network status, as further evidence of their claim: France's Canal Plus, Rupert Murdoch of the United States, Radio-Tele-Luxembourg (RTL), and RTL-Plus, a German-language service.

Canal Plus, a periodically controversial regional subscription television service, is encrypted during certain hours; it expected to be the first French programming service to become a designated national network. The terrestrially broadcast channel could use national coverage to expand a subscriber base that has been hovering around the break-even point. Now, however, Canal Plus will reportedly be forced to encrypt full-time after a new French-controlled Franco-Italian network, the first of two new designated national networks to be authorized by France, obtains its regional terrestrial broadcast licenses.

Rupert Murdoch, a former Australian, became a naturalized U.S. citizen late in 1985 in order to purchase an independent chain of terrestrial U.S. television stations. Murdoch, who is considered the world's wealthiest media magnate, could probably meet his transponder lease commitments under any circumstances, unlike the fledgling ad-supported DBS programmers. French officials—traditionally cultural xenophobes—may have viewed Murdoch's chameleon flag-of-convenience change and his well-known and often self-published conservative political views as dangerous sociopolitical threats.

The recent French machinations, however, may bode well for the Societe de Europeene des Satellites/Grand Duche de Luxembourg (SES/GDL) DBS project. Early in 1985, post and telecommunication (PTT) representatives from France and Luxembourg signed a "memo of understanding" guaranteeing Compagnie Luxembourgeoise de Television (CLT is RTL's parent company) one French-language channel (RTL) and one German-language (RTL-Plus) channel on TDF-1A. A number of major European banks and private investors later pulled the rug out from under American Clay Whitehead's rival RTL/GDS Coronet DBS project (see *Satellite World,* November 1984) and threw their support behind the SES/GDL project. The programming services that can't get onto the French DBS satellite have better reasons for doing business with SES/GDL now that France has voided the trans-border DBS pact.

Westinghouse Electric Corp.'s Group W cable unit, the third largest multiple systems operator (MSO) in the United States, will be purchased by a five-company group headed by Time Inc., for $1.6 billion. The Time-led group also includes Tele-Communications Inc.(TCI), the U.S. MSO with the largest subscriber base; Comcast Corp., the U.S. MSO with the largest cash flow; Daniels & Associates Inc., the 17th largest U.S. MSO; and Century Southwest Communications Corp., a smaller cable company. Group W's 140 cable franchises boast about 2.1 million total subscribers.

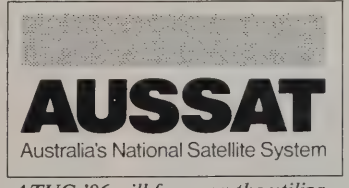
Westinghouse put its cable unit on the auction block in October 1985. It later granted the Time group the exclusive right to negotiate for the purchase. The agreement thwarts a leveraged buyout of Group W planned by another group headed by investment banker E.M. Warburg, Pincus & Co. Viacom International Inc. had arranged for the purchase of some of the Group W systems if Warburg Pincus gained control of the Westinghouse MSO.

Using the commonly accepted $1,000-per-subscriber U.S. cable system valuation rate, Group W is worth about $2.1 billion. The Time group will reportedly assume an additional $400 million to $500 million of Group W debt above the stated purchase price to add various Group W systems to their regional cable system clusters. Many of the limited channel-capacity Group W cable builds, however, need to be upgraded to more profitable, large-capacity wideband systems.

Time, Tele-Communications, and Comcast will each own about 25 to 30 percent of Group W's stock. TCI, with 3.6 million subscribers, and Time, with 2.5 million, will each add 500,000 or more new programming customers to their respective subscriber bases. With 500,000 new subscribers, Comcast would jump from the 18th to the 8th largest U.S. MSO. Daniels & Associates and Century Southwest would split the remaining Group W systems. U.S. regulatory agencies, however, must approve the terms of the complex sale.

U.S.-based Lucasfilms Ltd. went to court in an attempt to stop two U.S. lobbying organizations from using *Star Wars,* the title of a film produced by George Lucas, as a synonym for President Reagan's Strategic Defense Initiative (SDI) in televised political advertisements produced by the groups. The president, who inadvertently introduced the *ad hoc* appellation in a speech, was not named in the suit.

U.S. Federal Judge Gerhard A. Gesell ruled that the term had been derived from a work of fiction, not from a trademark; the court, therefore, had no jurisdiction over the use of the term as another name for the $40 billion research and development (R&D) project. Fiction writers have had their fantasy vocabulary appropriated and applied to reality since the days of Jonathan Swift, according to Judge Gesell.



ATUG '86 will focus on the utilization of Aussat capacity.

ATUG '86, the Australian Telecommunications Users' Group's third annual national telecommunications conference and exhibition, will take place March 18 – 20, 1986, at the Hilton International in Melbourne, Australia. For more information, contact: ATUG, P.O. Box 357, Milsons Point, NSW 2061, Australia. Telephone (02) 957 1333.

Australian-born media magnate Rupert Murdoch borrowed $448 million from at least 10 unnamed banks in 1985 in order to acquire 100 percent of Twentieth Century-Fox Film Corp., according to U.S. Securities and Exchange Commission (SEC) filings. Murdoch borrowed about $163 million early in 1985 to buy his initial 50-percent interest in Fox from Marvin Davis, the previous owner. He later borrowed an additional $325 million to purchase the remaining 50 percent. Davis, a U.S. investor, may have outfoxed Murdoch—the studio reported a net income of only $1.1 million for the fiscal quarter that ended in August 1985 after losses had been reported for the previous six quarters.

Last year Murdoch also agreed to purchase seven U.S. terrestrial television stations from U.S.-based Metromedia Inc. for $2 billion; one of those stations would be immediately sold to the U.S.-based Hearst Corp. for $450 million after the seven stations were acquired. Murdoch's Australian-based News Corp. said it would help fund the station-package purchase with an offering of new News Corp. preferred shares.

Murdoch became a naturalized U.S. citizen late in 1985 to circumvent U.S. federal regulations prohibiting foreign control of U.S. television stations. After Murdoch renounced his Australian citizenship, he was forced to relax his hold on two Australian television stations formerly controlled by his Australian holding companies; Australia also prohibits the foreign control of federally licensed television stations.

Birdview Satellite Communications Inc., a U.S.-based television receive only (TVRO) equipment manufacturer, laid off 282 employees representing about 40 percent of its staff, during a 10-week period late in 1985. Birdview said that staff increases had hurt its profits and added that a new product line required less labor to manufacture.

Just how much the well-publicized plans to scramble premium satellite-delivered programming services has depressed the U.S. C-band TVRO market is still a closely guarded secret. Birdview, like a number of other manufacturers, may have stockpiled too much equipment to justify a production schedule premised on overly optimistic 1985 sales predictions. Birdview's sales growth for the fiscal year ending in March 1986 will average 30 to 60 percent, according to a December 1985 Birdview estimate.

France's TDF-1A direct broadcast satellite is now scheduled for a July 1985 launch, according to Television par Satellite. The satellite, to be stationed at 19 degrees west, will be equipped with a unique antenna-pointing device capable of ±0.1 percent boresight accuracy, and three 230-watt transponders and three 260-watt transponders manufactured by AEG-Telefunken of West Germany, if everything goes according to plan. Four transponders will be used to deliver D2-MAC-standard TVRO broadcast signals to a potential European audience of 300 million; the other two French transponders will serve as onboard spares.

The satellite, however, may not launch until April 1987, according to other European reports. After two low-power transponders used to distribute cable services on Eutelsat-IF1 began losing power prematurely late in 1985, it was widely rumored that the European Telecommunications Satellite Organization's (Eutelsat) workhorse would fail before the end of 1986. TDF-1A's high-power traveling wave tube amplifiers (TWTAs)—also built by AEG-Telefunken, a West German firm—may have to be subjected to additional time-consuming prelaunch tests.

High-power Thomson-CSF TWTAs could be substituted, but they may not be that attractive an alternative. Japanese officials blamed the failure of two of three BS-2A high-power transponders on Thomson-CSF TWTAs that overheated. Lower-power TWTAs, such as the 47-watt units used by RCA's Satcom K1 and K2, could be used if the designated programmers are willing to challenge the still-popular "true DBS" mythology. The lack of stockpiled D2-MAC French-standard receivers could also complicate the TDF programmers' marketing strategies.

The 1985 loss of the European Space Agency's (ESA) Eutelsat-IF3, however, has already reduced the near-term financial risks associated with delaying the launch of Eutelsat-competitive television programming distribution satellites such as France's

(continued on page 45)

By Gregory Frazier

Building Bridges

The latest event to showcase the global reach of satellite communications featured a 10-satellite "Spacebridge" that linked seven nations on five continents.

The early morning crowd at San Francisco's Masonic Auditorium burst into spontaneous cheers and applause as the first television pictures beamed in from Mexico City via the Morelos F1 satellite. Some 3,000 spectators had come to witness the presentation of the third annual Beyond War Award to the Five Continent Peace Initiative, a spectacular five-continent, seven-nation, two-way global TV linkup of North and South America, Europe, Asia, and Africa. Ten satellites and four million miles of signal path spanning thirteen time zones would make this the most ambitious undertaking in mass communications history.

The six heads of state honored for their contributions to world peace were Raul Alfonsin, president of Argentina; Andreas Papandreou, prime minister of Greece; Rajiv Gandhi, prime minister of India; Miguel de la Madrid, president of Mexico; Olof Palme, prime minister of Sweden; and Julius Nyerere, president of the United Republic of Tanzania.

In January 1985 these world leaders had met in New Delhi and issued a declaration urging a halt to the testing, production, and deployment of nuclear weapons. The declaration stated in part: "If the old doctrines are applied in the future, the holocaust will be inescapable...nuclear war can be prevented if our voices are joined in a universal defense of our right to live. We urge people, parliaments, and governments the world over to lend forceful support to this appeal."

Gregory Frazier

A portable uplink was parked on the street outside of San Francisco's Masonic Auditorium.

Early on, the founders of Beyond War, a nonprofit, nonpolitical educational foundation based in Palo Alto, California, realized satellite technology would play a key role in communicating its message that nuclear confrontation is no longer a workable alternative to solving the world's political problems. Since its founding in 1983, Beyond War has grown to international proportions, with 400 full-time volunteers and 8,000 active supporters. The December 14 telecast, dubbed "Spacebridge" by executive producer Mel Swope, cost approximately $500,000—all from donated funds. According to Swope, if every nut, bolt, and downlink required to produce the event had been purchased, the bill would have totaled over $1 million.

Viewers in the United States and southern Canada saw Spacebridge by means of 157 downlinks, the majority contributed by Beyond War supporters. The program was also broadcast live in several countries. In India alone, an estimated one hundred million people viewed the program. In the United States, the 90-minute program was edited to 60 minutes and offered to Public Broadcasting Stations for rebroadcast.

The "In-House Program" and the "International Feed" were shown on giant screens inside the Masonic Auditorium.

In San Francisco, spectators at the Masonic Auditorium saw two video feeds: an incoming "In-House Program," and an outgoing "International Feed." The incoming pictures from the six foreign nations were shown on a giant 10.5-by-14-foot screen that was often split six ways. The outgoing picture, originating from the auditorium, lit up three 9-by-12-foot GE PJ 5055 screens that formed three sides of a large cube suspended above the stage.

Stephen Adams, general manager of Netcom Video, the company that provided the video projection systems here and at several other downlinks, said he had brought in over $1.5 million worth of equipment. "In terms of video, this event ranks among the top five of all time," Adams said. Another division of the company, Netcom Satellite Services, contracted for several downlinks, including two at Masonic, and booked time on the domestic satellites Westar IV and Satcom 1R.

Director Phil Martino, whose forte is sports and other live video events, conducted the program from inside a brand-new custom $2.5 million mobile unit. According to Skip Long, president of Bay Area Mobiletape, the equipment at Masonic Auditorium included five cameras, four 1-inch and ten 3/4-inch VCRs, three dual-channel audio systems, and a crew of eighteen. Director Martino was in constant communication via dedicated phone lines with six associate directors, all Americans, in the various foreign countries.

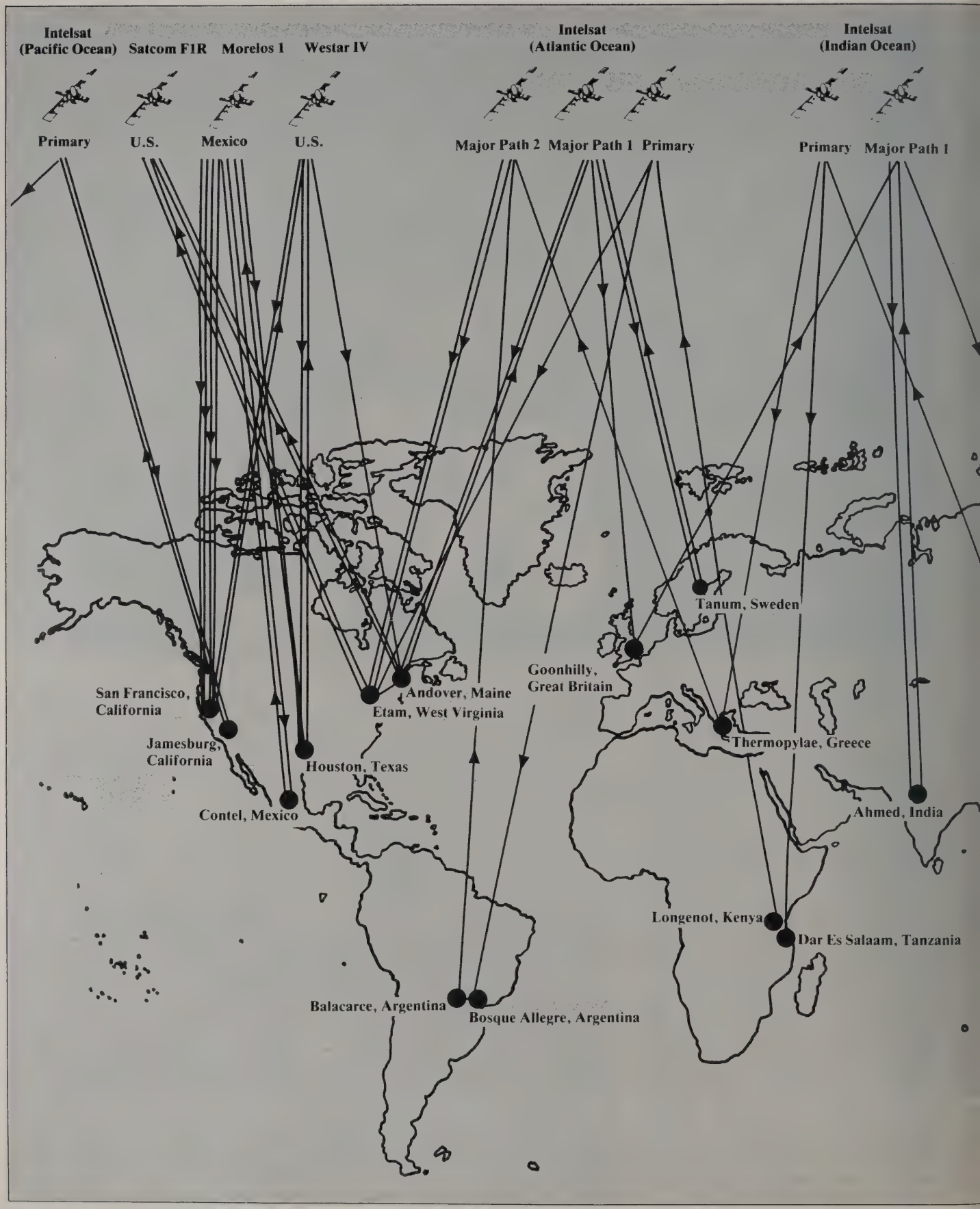
Linking Up

English was overdubbed in San Francisco before the international feed was forwarded around the world. Initially there was a problem with the simultaneous translation, but it was quickly corrected.

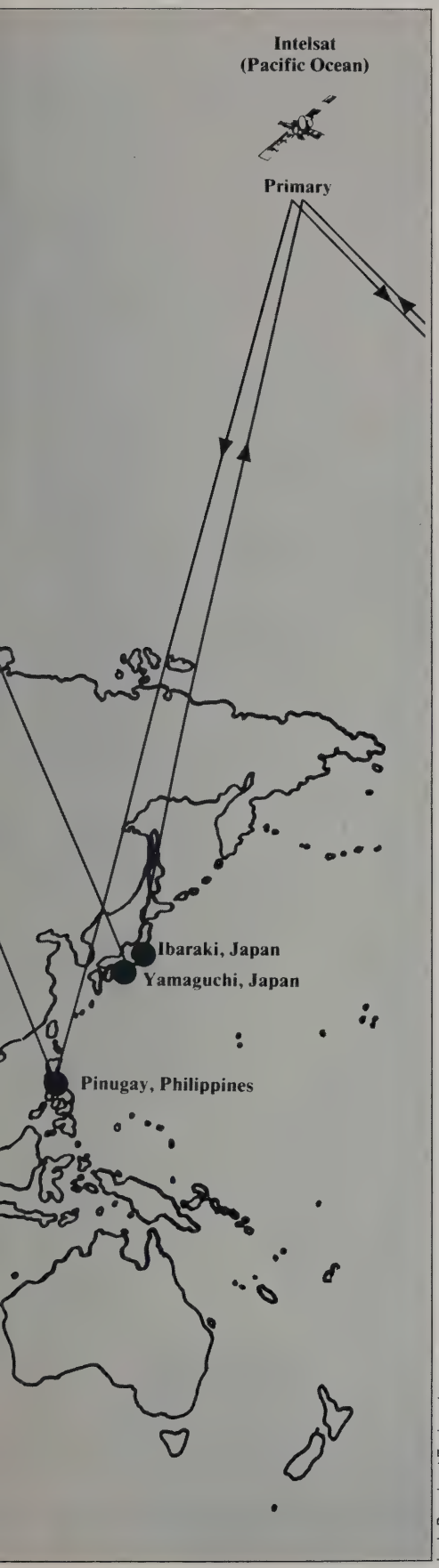
"Considering the complexity of the event, we were delighted to get signal into the mobile unit," Long said. "Many of us had some serious doubts as to whether or not we could bring in a picture from Tanzania, but everything worked out well in the end."

Perhaps the most amazing feat was the complicated routing of the four million miles of signal paths. To reach San Francisco from New Delhi, for example, the signal was uplinked to an Indian Ocean Intelsat, down to an earth station in Ibarake, Japan, up to a Pacific Ocean Intelsat, down to the Jamesburg earth station in Monterey County, and finally to Masonic Auditorium via a four-hop terrestrial microwave relay.

Outgoing signals followed several complicated paths. Uplinked to Westar IV, the signal was downlinked at Andover, Maine, then up to an Atlantic Intelsat for distribution to Argentina and Sweden. To reach India, the signal was downlinked at Goonhilly, England, uplinked to an Indian Ocean Intelsat, and then downlinked to India. To reach Greece and Tanzania, the signal traveled up to a Pacific Intelsat, down to Pinugay, the Philippines, up to an Indian Ocean Intelsat, then down to Greece and Tanzania. Morelos F1, the Mexican satellite located at 113.5 degrees west, was used to carry signals between the United States and Mexico



Spacebridge transmissions were routed through 4 million signal-path miles, according to the event's organizers.



Lude Broadcast Engineering

for only the second time—the first was during the Mexican earthquake. It was necessary for the Beyond War organizers to obtain special permission from the U.S. Federal Communications Commission to use Morelos.

Video engineer Jim Little, a full-time Beyond War volunteer and the organization's technical advisor, praised several key organizers. One of these, Matt Adams, coordinated all of the international satellite traffic. "Adams is one of about six people on earth who have the expertise to implement a communications event of this magnitude," Little said. Another key organizer, technical director Ed Kyser, actually traveled to each of the countries involved.

Little said that the organizers' chief concern was delivering a signal from Tanzania, an African nation without any television whatsoever and limited technical expertise. "We had to build the Tanzania system from the ground up," Little said. A TV production crew was brought in from Kenya, and microwave equipment from Uganda and the United States. Over 1,500 miles of terrestrial microwave delivered the signal from Dar es Salaam, Tanzania, to Nairobi and finally to an uplink in Longenot, Kenya.

"On December 12, they had a monsoon in Tanzania," said executive producer Mel Swope. "We were scheduled to have the event take place in a traditional African tent. When the rain collapsed the tent, we had to move everything inside. So not only was this the first live picture from Dar es Salaam in East Africa, but we also had to make some quick last-minute changes to get it."

As with any event of such immense complexity, when the moment of truth arrives one can only cross one's fingers, hope for the best, and flip the switch. "This is by no means a secure event, as any first event is not secure," said Beyond War President and program host Richard Rathbun in his opening remarks. "It is very fragile. I'm thinking of the thousands of miles of wire those signals have to travel through, the thousands of fragile little connectors...and I know this is a fragile event. We're not absolutely sure it's happened until it's over."

All things considered, the event came off remarkably well, with only a few relatively minor glitches. Ironically, although Tanzania was considered to be the weak link in the global chain, it was Sweden that suffered the most serious technical problem. The audio failed just as Swedish Prime Minister Palme was about to receive his award. The failure was attributed to a downed terrestrial microwave link near Stockholm. At this point the program was switched over to Tanzania. When audio was restored in Sweden, the award presentation was repeated there. "It is an advantage of satellite disturbances that one gets the chance of receiving the same award twice," Prime Minister Palme quipped.

Other minor technical problems included some audio echoing at the beginning of the program, which was quickly corrected, and generally poor video (dark, wavy picture with bars) from Tanzania, attributed by technicians in San Francisco to video-standard conversion problems and accumulated noise picked up over such a long signal path. Secam, PAL, and NTSC were all used and converted for the event.

Each award presentation was followed by a two-minute acceptance speech by the recipient. President Nyerere of Tanzania, who seemed genuinely awed by the magnitude of the event, said, "This is a demonstration of what modern technology should be doing." And Argentine President Alfonsin stated: "The best prize that we receive today is that we've been allowed to put our voices together."

A cultural presentation by each nation followed the speeches. Greece, Sweden, and Argentina presented children's choirs; Mexico and Tanzania, dance companies; and from India, Ravi Shankar rocked Masonic Auditorium and the globe with a sizzling sitar raga.

After the event, executive producer Mel Swope was beaming. Swope, a veteran of last year's Beyond War teleconference between San Francisco and Moscow, and producer of *Miami Vice* and *Fame* segments, said that the world is in fact becoming a global village. "The more we do it, the better it's going to become," he said. "Like they say in the commercial, the more we can reach out and touch someone, the better we'll be able to understand each other's point of view. We have to move beyond our different languages, cultures, and political systems in order to coexist. Otherwise, we're simply not going to be here."

By Vladimir Liska
Engineering Manager, DGH Television Systems Ltd.

The International MMDS Market

Cost-effective microwave rebroadcast systems can bring multichannel television to isolated areas too expensive to cable.

Granite mountains tower above a remote valley where a small village lies sheltered in the lee of lower hills. In the village, small rooftop parabolic reflectors attached to chimneys, short poles, or directly to attic window frames point at a nearby hilltop where an earth station was constructed a few months earlier. Before the satellite antenna system was installed, the villagers were virtually isolated from the outside world; because of the mountains, not even a nearby television station could be received. Now, thanks to satellite signals retransmitted into the valley on a number of channels, villagers can choose from news, sports, theater, and other entertainment programs.

Called a multichannel multipoint distribution system (MMDS), this type of over-the-air distribution was originally developed in the United States to distribute educational programming broadcast on instructional television fixed service (ITFS) frequencies between 2500 and 2690 MHz. Eight ITFS channels are now used for local pay TV in a number of U.S. cities. MMDS may soon become common throughout the world in thousands of villages where satellite signal reception and distribution by a cable system may be impractical.

Operating in the 2- to 2.7-GHz band, an MMDS installation can provide service within a radius of 20 to 30 kilometers (12.5-18.5 miles). If necessary, the signal can be secured by inverting the standard aural-visual carrier placement scheme so that the video carrier is placed above the frequency of the audio carrier. The audio carrier is usu-

Hughes Microwave Products Division

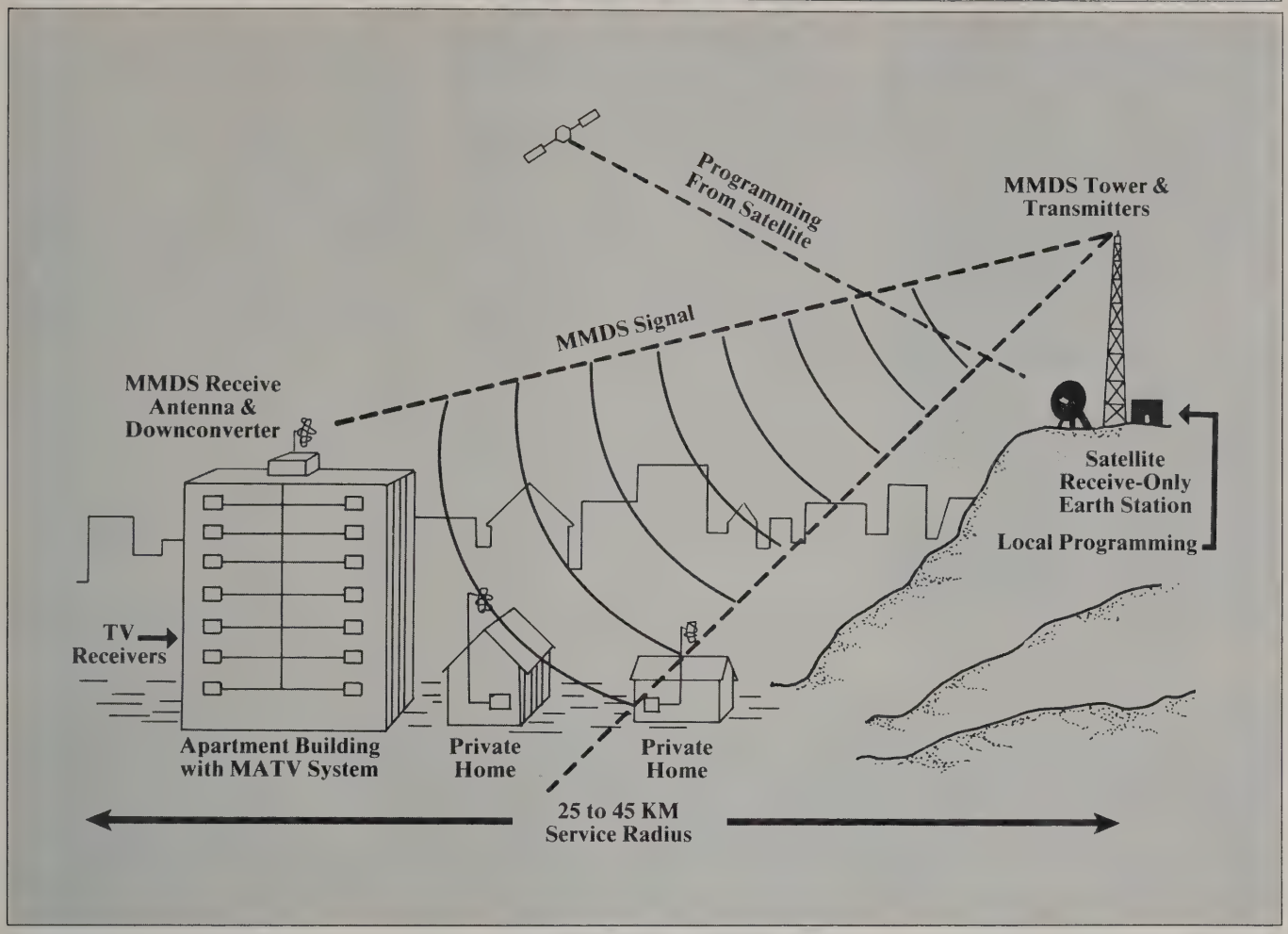


Figure 1. MMDS Distribution System

ally transmitted 16 dB lower than the video carrier to improve intermodulation in the downconverter. The transmitter site configuration is comparable to a low power television (LPTV) station, with the combined outputs of all transmitters feeding the antenna array; but the higher MMDS frequencies allow for more precise antenna radiation control, from coverage of a narrow valley to a complex pattern suitable for a small town. The higher frequencies used for MMDS also mean that smaller transmit antennas, easier to mount and maintain in mountainous terrain, can be used instead of prohibitively large UHF/VHF antennas. The transmitter can be located on a high building, a tower, or on a hill with a clear view of the desired satellite. Figure 1 shows a typical MMDS configuration.

To minimize noise, the low noise amplifier and downconverter should be installed very close to the receive antenna. With a parabolic antenna, the downconverter is usually built into the feed support tube. The cable to the home terminal carries the received channels in the UHF portion of the band. In the reverse direction, the cable provides DC voltage to the downconverter (Figure 2).

The MMDS transmitter-to-receive antenna path must be free of trees, buildings, or other obstructions that can partially absorb signals. A signal-strength survey by an experienced technician is highly recommended to guard against unwelcome surprises such as signal loss caused by a spring growth of leaves. Particular attention should be paid to multipath signal propagation, which causes ghosting when unwanted signals reflected from obstructions are received at the dish along with the transmitted signal. Evidence of multipath signal propagation can be detected with consumer equipment modified for portable use. Figure 3 shows such an arrangement suggested by Texscan. The test set uses a black-and-white 6-inch TV receiver and can be carried in a small suitcase. When multipath signal propagation is a problem and it is not possible to move the receive antenna to a better location, a higher-gain antenna with a narrower beamwidth can be used. The narrower beamwidth will lower the amount of reflected signal received.

MMDS: A Worldwide Market

Within the past two years, MMDS has attracted a great deal of attention at communications trade shows. One company has shown particular interest in the potential of this new market opportunity. MTX Telecom Services, Inc., a subsidiary of Canada's Manitoba Telephone System, assembled a marketing and engineering team to evaluate the worldwide potential of MMDS. This team, which has visited a number of countries in Europe and South America and obtained very positive responses, has found that the most immediate need for MMDS is in Northern Europe, especially in Iceland, Denmark, Norway, Sweden, and Finland. These countries, with the exceptions of Denmark and Finland,

do not have terrain suitable for cable installations, and most of the small population centers do not have a clear view of the geostationary orbit because of mountains or high latitudes. In Southern Europe, the best candidate for MMDS is Spain.

• **Iceland and Denmark**—These countries are expected to install their first operational MMDS systems shortly after field trials begun in 1985 are completed.

• **Norway**—Norway's greatest potential for MMDS is in the west and northwest areas of the country, where most of the communities are in valleys. The southern portions around Oslo are already cabled.

• **Sweden**—With the same topographical characteristics as Norway, Sweden does have a need for MMDS. However, before this type of so-called "new media" service can be implemented, a cohesive business structure must be formed that clarifies the roles of various Swedish tenant and landlord associations. This should prove to be only a temporary obstacle, since the need for an effective terrestrial delivery system is clearly understood both by consumers and the investment firms funding satellite endeavors.

• **Finland**—In Finland, where cable television is already established, the potential for MMDS lies in difficult-to-cable areas or in pay-TV applications.

• **Spain**—Although some marketing will be necessary to create awareness of MMDS capabilities, Spain has large urban populations able to support a multiprogram operation on a cost-effective basis. MMDS operations in 10 key cities could be established as early as 1987.

South America

South American countries are becoming good candidates for MMDS because of the number of satellite services scheduled for introduction in 1986. When system economy is emphasized, MMDS can prove to be a winner. Locally manufactured hardware for transmitters and especially for receivers, is usually available at relatively inexpensive prices (see "Made in Brazil," *Satellite World*, December 1985). With tunable downconverters, simple television receivers using intermediate frequency inputs can be purchased in quantity. Such an MMDS system is easily expandable for additional channels, and scrambling is available for applications in larger cities.

• **Brazil**—A protective industrial policy would require MMDS systems to be built under local license, but this country could become one of the largest users of MMDS due to its size, well-developed industry, and huge population.

• **Chile**—This country has indicated interest in alternatives to cable distribution. Although cable franchises have been awarded to operators in Santiago, high construction costs have contrib-

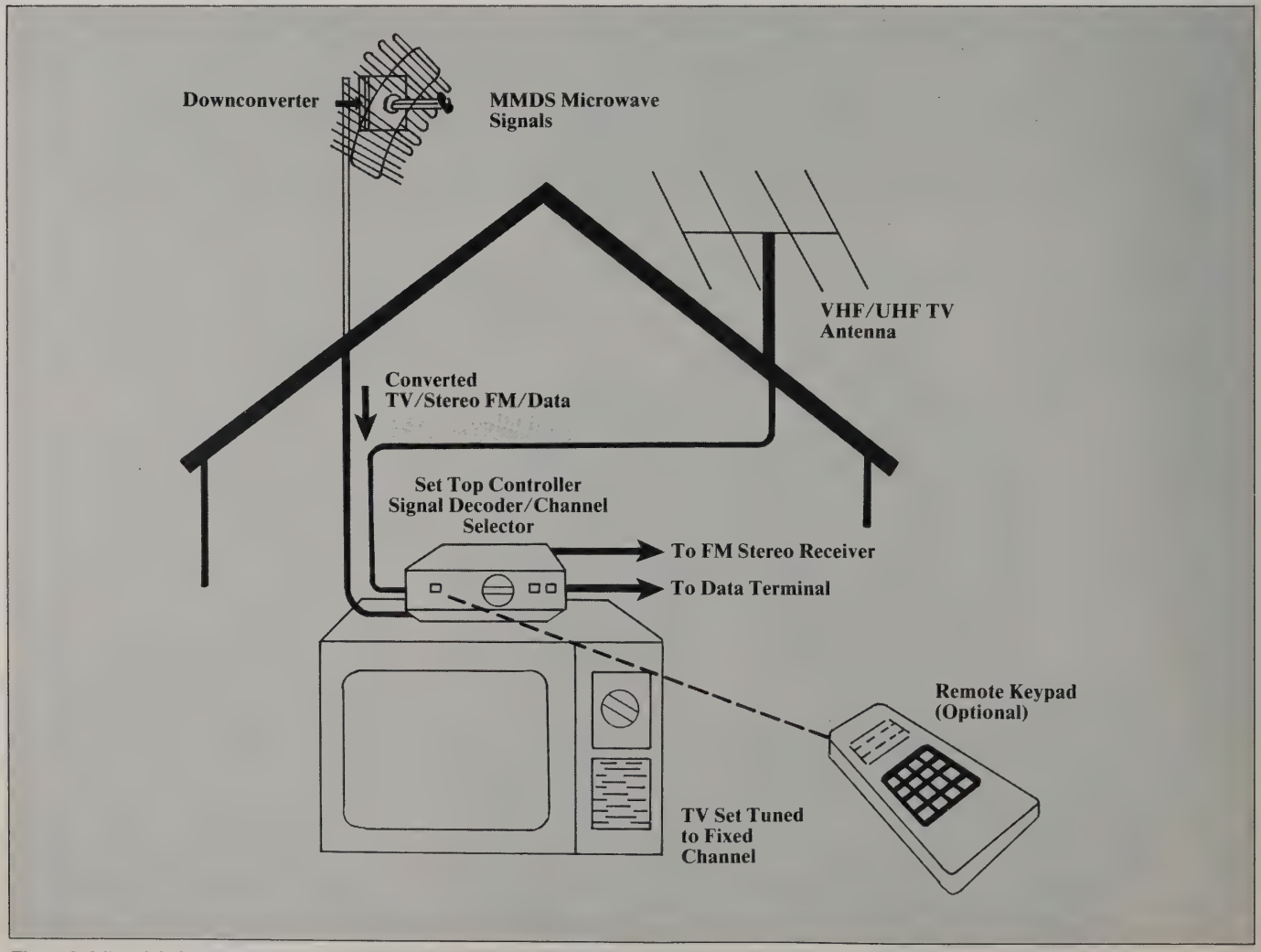


Figure 2. MMDS Subscriber Receiving Configuration

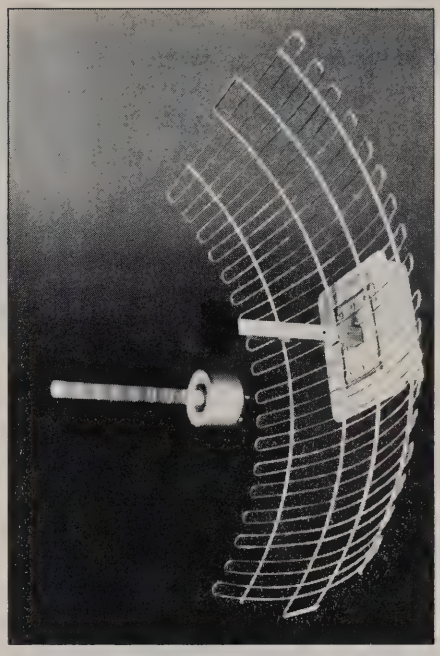
uted to very slow growth rates.

• **Colombia**—Colombia recently passed legislation opening up the possibility of pay television. There are several large cities with sufficient numbers of potential middle-class subscribers interested in expanded service in both English and Spanish to justify MMDS builds. The combination of a positive regulatory environment and significant market size makes Colombia the most likely target for 1986 MMDS implementation in South America.

• **Ecuador**—With regulatory matters currently under consideration, a number of businessmen are actively lobbying for MMDS licenses in Ecuador. The size of the country's market, as well as its political and economic stability, will guarantee the success of MMDS operations there.

• **Peru**—Only one application has been received for a pay-TV service, in Lima. The operator has been granted a license, and the system should be up and running in the near future.

Offering an excellent method of quickly reaching subscribers over a large area without the prohibitive costs of cabling, MMDS is also considered a mature technology that has been proven in a large number of cities across the United States. Transmitting equipment is also available from many sources. With many countries not mentioned here also studying MMDS applications, this budding industry is in the same position as the satellite and cable television industry was in the 1970s. Mr. Bill Evans of MTX Telecom Services even sees an MMDS market soon developing in Australia and New Zealand because of liberalized access to satellite programming. There are also numerous countries throughout Africa and Asia where the demand for multichannel television programming can be quickly satisfied by MMDS.



Spatial Communications's dielectric lens antenna is smaller than a standard MMDS antenna.

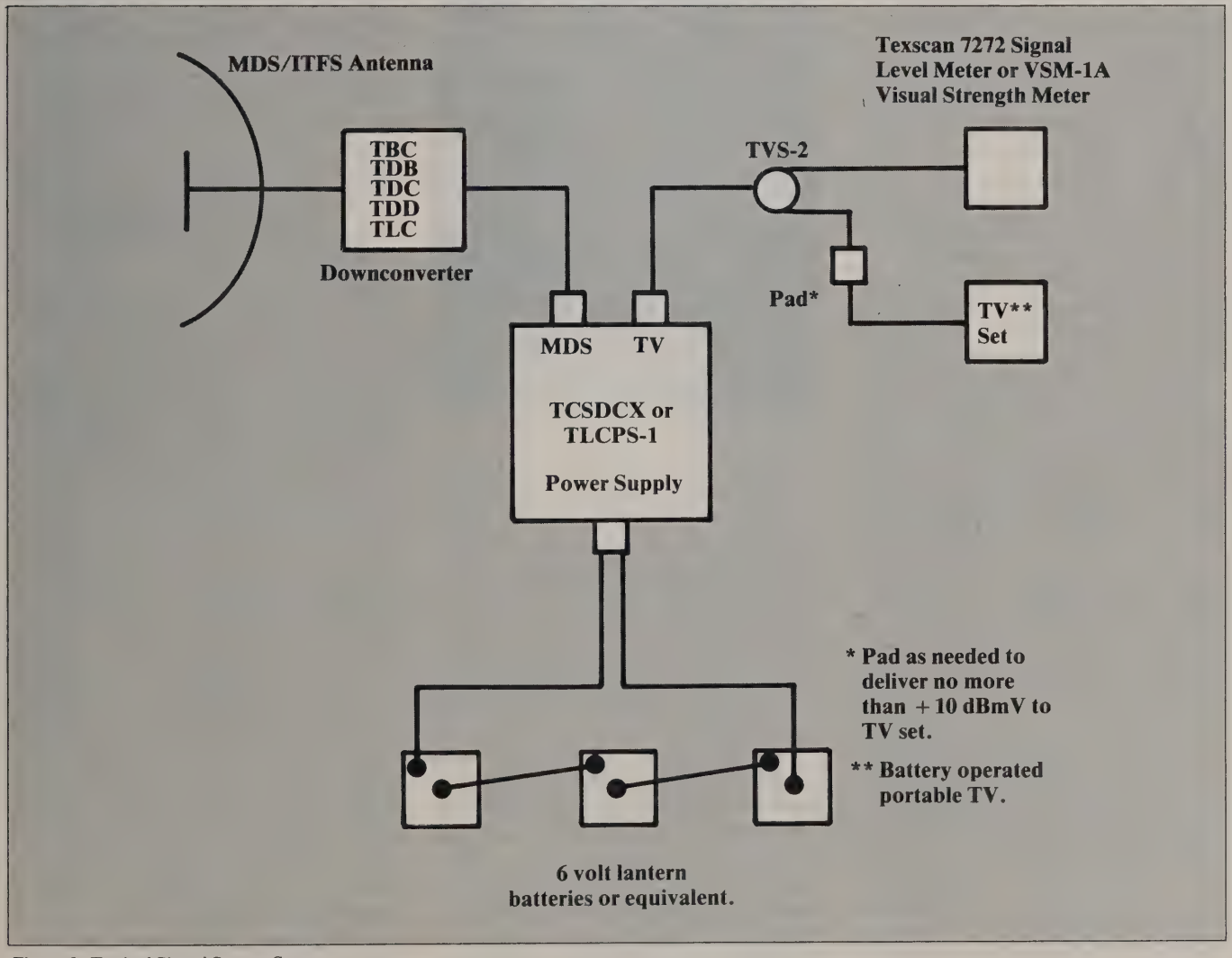


Figure 3. Typical Signal Survey Set-up.

By Kevin Brass

The Evolution of Scrambling Technology

Dr. Leo Jedynak, formerly of Oak Industries, talks about letting the marketplace set the standards.

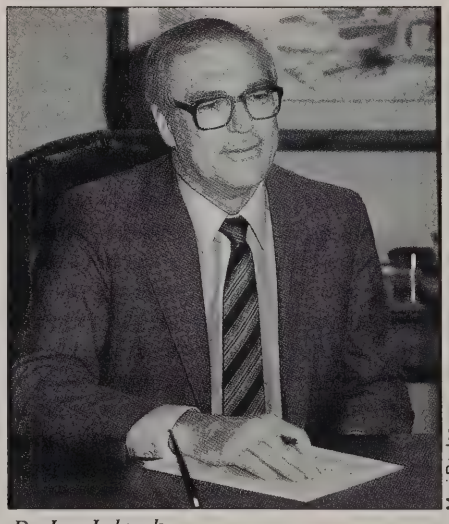
To satellite industry observers, the recent resignation of Senior Vice President and Chief Scientist Dr. Leo Jedynak was one more indication of the widely reported woes of Oak Industries. Jedynak, a former instructor of electrical engineering at the Massachusetts Institute of Technology, helped establish Oak's Wisconsin, U.S.A.-based corporate research and development facility in 1968. He became its first director in 1969 and was later elected to Oak's board of directors. Jedynak was considered the heart of Oak's research and development (R&D) department.

Jedynak is widely respected as an expert on television encryption devices. He was one of the key men in the development of early signal-scrambling mechanisms. A strong and articulate advocate of direct broadcast satellite (DBS) systems, he recently served on the U.S. Federal Communications Commission's (FCC) advisory committee on technical standards for DBS.

At the time of this interview, Jedynak, 55, was still working out of his Oak office, although he said he had already severed all ties with Oak. He had not yet decided whether to form his own company or to accept one of several other offers. He is now vice president of engineering and operations of the Telecom Group of the Technical Division of American Diversified Capital Corporation, a nationwide paging service based in Costa Mesa, California, U.S.A. Jedynak stated that he preferred not to discuss Oak's much-publicized problems. However, he was more than willing to delve into several of the key issues facing the satellite industry.

Satellite World: Has cryptography proven itself as a solution to piracy problems?

Leo Jedynak: Virtually all of the equipment out there right now is defeatable



Mari Boyles

Dr. Leo Jedynak

in one way or another. But the encryption technique which is now becoming very popular in the industry is a secure way; you don't defeat it. You've got to understand that encryption is generally associated with digital techniques. In the United States there is, in the commercial world, a specified standard of encryption for data in digital form, the Data Encryption Standard [DES]. It is considered the standard by the National Bureau of Standards and the National Security Administration. It was developed by IBM, originally for internal uses, and became a national standard. It is very, very strong security, that's not, to my current knowledge, defeatable. You can intercept an encrypted message, but you can't decrypt it without knowledge of the key and the decryption mechanism. You can still have encryption at a lesser level, which is defeatable by recording the encrypted data and using a computer to look for correlations.

SW: Anything to save you $11 a month.

LJ: Right. The problem with these lesser techniques is that you can't decrypt in real time. I coined a phrase, "entertainment grade" encryption, which I interpret as encryption secure enough that the cost of decrypting and the delay involved aren't worth the effort. You know you can go to the video store and rent the darn tape for $2.50. Why use a big computer and sophisticated recording equipment to recapture a movie?

SW: Is there a move to make illicit decryption even tougher, by increasing the time and energy needed?

LJ: I think it's fair to say that the industry, in terms of looking at the satellite area, is going all the way to DES. It's something you can do today because the integrated circuits used to do the decrypting are relatively inexpensive.

As the concern over piracy increases, the pressure mounts to have a form of scrambling that is not defeatable. At this time, it looks as if that really requires encryption. The encryption is confined to the audio, because when you convert an analog system to digital, what you've done is called bandwidth expansion. Where it might have been "X" megahertz wide, now it may be ten times that wide. Well, in a television channel of six megahertz, the audio occupies maybe fifteen kilohertz, so you can expand it up to a couple of hundred kilohertz—it doesn't matter; there's room for it. But because the video is four megahertz,

you don't have any room for expansion. So the strategy was, and is today, to encrypt the audio signal so that it is very secure. Then you do as much as you can to the video to make it difficult to decrypt, but it's still analog and hence, defeatable. It's a trade-off: the more secure you get, the more it costs; the more it costs, the more the market starts to fade.

SW: Has the technology eliminated the fear of piracy? Is it no longer the problem it was?

LJ: Well, in my opinion, the piracy problem is not critical for pure entertainment signals—even though they are premium for-fee signals. The technology is adequate, although there will be some minor problems. The critical thing is that the television has two components of entertainment, the video and the audio, and you really need both. For special presentations such as a horse race or a major boxing event, you don't need the audio. The video is sufficient. So, yes, there is going to be an effort to make the video unscrambling even harder in the entertainment world because of those very special events.

Notice, however, that I keep saying "entertainment world." There are other applications of television and satellite communications. The stock market, teleconferencing, private communications, and industry—the oil industry in particular—all need very, very secure video as well as audio. I believe that application, non-entertainment application, will still drive the technical effort to get stronger and stronger hard-security television signals from satellite transmission.

There is great concern that the security of industrial communications in this country may be inadequate, since there are many countries covertly eavesdropping on commercial/industrial telephone communications. So there is pressure from government on our commercial/industrial community to secure its transmissions.

SW: How does the DBS system fall into the evolution of the industry?

LJ: Once you get past the cable technology, you say, "How many homes have we satisfied?" There have been projections that 80 percent of U.S. homes will be covered by cable eventually. I think a more reasonable figure is 40 to 45 percent. But the people outside of broadcast and outside of cable coverage—where do they get their television? Well, there are two ways: They get it from the video stores, which they do to a very great extent, or they get it by satellite. There's just no other mechanism. So the concept of direct satellite-to-home television has as a primary target those people outside of broadcast and cable areas. They need television.

It really comes down to using a different technology. And a different technology that's there, ready today, is selling. It's a proven technology.

SW: Are there other, less expensive ways of reaching them?

LJ: Some people would say, "by fiber optics." It's very popular to say fiber optics. Fiber optics uses mechanical connections, so you still have the cost of stringing it. In sparsely populated rural areas the labor costs will still be high. The material cost of laying cable is not the difficult thing, it's the labor involved. So fiber optics is not a solution. A network of microwave links and translators spread all over the country is a potential technology, and I believe in Europe a couple of countries are going that way to reach all of their people, especially in areas with rugged terrain. And I know New Zealand is planning to go this way. They'll eventually blanket the entire country with a few television signals. But I think a characteristic of all of those countries is that they are geographically small. When you try to do something like that in the United States it's a little more mind boggling.

SW: From the business end, is there going to be enough of a market for the industry to pursue it the way it has in other areas?

LJ: Yes. It is there. Let's back up a little bit. At one time we had, I think, nine primary recipients of go-aheads from the FCC with regard to U.S. DBS construction permits. It's now down to two or three in the first round and more in the second round. And so that would make you ask, "Is it really viable? Why is everyone dropping out?" Fundamentally, I believe it's a viable business. There's a basic problem in that the cost, the up-front cost, is extremely high. At one time, some news releases were saying it would be close to a billion dollars. And it's difficult to get that kind of money together. If you could get that kind of money together and you did get into those sparsely populated areas, I think it would be a viable business.

SW: How does that encryption affect your DBS capabilities?

LJ: First of all, we hypothesize right from the beginning that you would encrypt in such a way that you wouldn't have a piracy problem—that's fundamental. You're really looking at a minority market, so you want to get every consumer. No piracy calls for encryption. This means that in the home, besides the dish, the low noise converter, and the receiver, you also have to have decryption equipment. And all of these cost. Generally the DBS industry has taken the stand that the whole package should run five hundred dollars or less. Now maybe the cost's a little more than that, but the further you get below five hundred, the better the chance of achieving true success. Five hundred dollars is a very viable figure.

SW: Could you venture a time frame for that?

LJ: It's a chicken-and-the-egg situation. You can't get the price down until you get the volume up, so somewhere up front somebody's got to put an awful lot of dollars into the program to carry the costs until the volume is up. Comsat's schedule was to have the first launch late in 1985 and to be running sometime in 1986. As you know, Comsat is going forward with the construction permit but has deferred any further specific [Satellite Television Corporation] business activity in DBS. Comsat is not claiming that it's not a viable business; it's just that, at this time, the company isn't able to get the package together. So the answer is we don't know when DBS is going to take off. The Dominion satellite is moving forward, but is heavily oriented toward religious programming. Dominion has a very special market and a very special motivation. It may be the one that breaks it all loose. You have Hubbard's USSB [United States Satellite Broadcasting Inc.], still very active in DBS, with its own business plan which is very creative. And some more have come in. So it's moving forward. It's not stopped. I'm always called a forever optimist, but I think DBS will happen.

SW: Has the technology outstripped the demand?

LJ: People are putting in backyard dishes at a tremendous rate. They want those signals, and they're paying quite

a bit more than five hundred dollars. I think the market has revealed itself. The people are doing it of their own accord.

SW: Where does the federal government come into all this? Should the government regulate?

LJ: The philosophy of the FCC, the Federal Communications Commission, for the last few years, has been and continues to be a philosophy of deregulation. As you know, there was strong sentiment in the country for establishing standards in DBS. So the FCC, on the basis of a considerable number of requests, created the FCC Advisory Committee on DBS Technical Standards, which operated for about a year and terminated last July. It was comprised of voluntary membership of all people who were interested in the subject. Virtually every company in the United States in any way related to satellites was represented. So were a lot of individuals. Fundamentally, the group worked on three technical issues: on the transmission signal format and developing a standard for it, on a standard for the receiver design that would be compatible with the transmission format and compatible with the encryption or unscrambling format, and on encryption-decryption. The FCC made it clear at the beginning that the three subcommittees were advisory. Whether they would do anything with the reports or not was unknown. Recently it was said that the FCC will be coming out with a statement with regard to what it has done with the submissions.

SW: What was your attitude toward the submissions?

LJ: My personal attitude was ambivalent. I can see from the individual's standpoint the logical benefits of standards. The standard, fundamentally, means minimal cost. If everybody is using the same equipment, then the volume is higher and the cost is lower. On the other hand, as an entrepreneur, I would rather have the best equipment, let that capture the bulk of the market, and then let it, on a de facto basis, become the standard. Essentially I think those were the two sides of the argument in meetings and discussions.

SW: How did the submissions by these committees respond to those areas?

LJ: I think the majority felt that it was not a thing that you could really debate. What the committees did was work very, very hard to try to analyze the technical situation on the supposition that there were to be standards, that this was advice about what alternatives there might be, and which might be the best way to accomplish goals.

SW: How did the committee respond to the key issues?

LJ: In the encryption area, it was extremely difficult because, in effect, there are several different, technically viable and economically viable suppliers of encryption/decryption equipment. Most of these organizations had newly developed equipment that they treated very properly as company property. And hence their representatives could not volunteer information or answer specific questions. It became exceedingly difficult to actually discuss scrambling and descrambling as a specific technical subject. So the committee moved to solve another problem. Essentially we assumed that there would be more than one kind of scramble/descramble equipment. So then the committee said, "Well, let us look at the interfaces between the descrambler unit and the receiver unit and the television set, and let's try to develop a standard interconnect between those units." Then whatever scrambler/descrambler was made, whatever descrambling equipment anyone might have wouldn't matter. As the signals from the receiver were accepted in that format and then fed to the television set according to the interface specifications, compatibility was guaranteed. Anybody's descrambler could be dropped in and would work with any receiver and any television set. That, I think, was quite an achievement.

There was discussion about letting the marketplace determine the standards. Many feel that the competition among the suppliers will be such that an effort to make a better product will lead to the best product, and that everyone eventually will recognize the best product—and that will then become the standard. That's a fundamental philosophy, and that's the direction that the FCC is going.

SW: Given what you just said—that competition is expected to produce the standard—then one shouldn't be surprised that the advisory committee was not able to decide on a standard.

LJ: Some members of the committee wanted a standard to be developed. They felt that it's important to the viability of the DBS industry to get those costs down as quickly as possible.

SW: From a research point of view, won't competition always breed a more competitive research environment?

LJ: I would like to compete on the basis of a product that outperforms everyone else's and not be bound by the decisions made by people some years ago, having to use a standard from an earlier stage of technology. This what has happened to broadcast television in this country. The NTSC [U.S. National Television Standards Committee] did this years and years ago. They did a fantastic job, but if you go to Europe or Australia, you see a lot better television signal.

SW: Is it unrealistic to believe that standards will be established for the satellite industry?

LJ: There are standards in satellite television communications now in existence that have nothing to do with scrambling or descrambling. You don't have to stick to them, but everyone does. They're standards in the sense that the industry accepts that the uplink is going to operate under these rules, or if I make this receiver today I can sell it in competition with any other receiver.

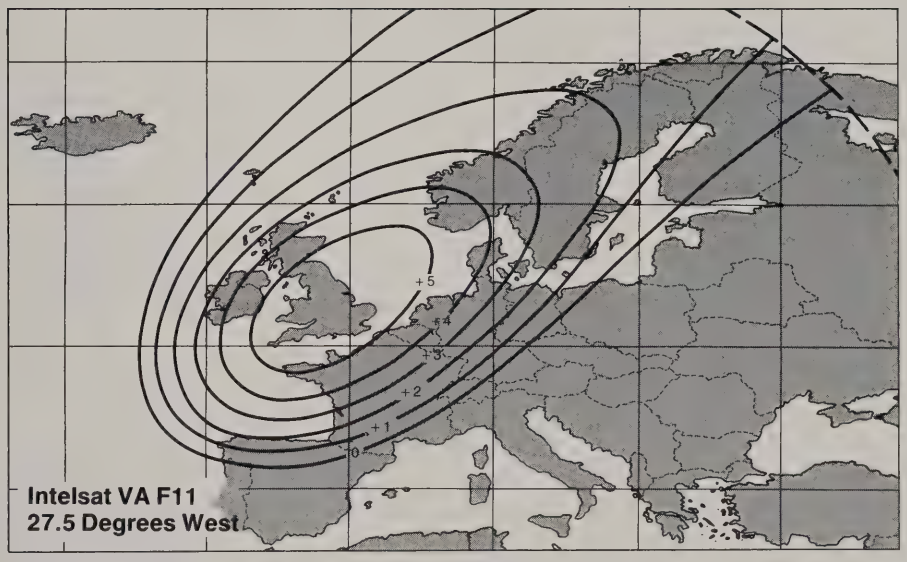
There is another industry committee called the U.S. Advanced Television Standards Committed [ATSC] which has representatives from virtually everybody in the television industry. These people meet regularly, and they have working groups. They have a working group on high definition television, true high definition television. They have another working group on transmission standards. Essentially, you can take what we've got now and make it a lot better by doing relatively small things while maintaining compatibility with all those millions of TV sets and thousands of transmitters. So between cable and satellite, I believe that the fourth generation television has a means of coming about without the creation of anything new. All you have to do is create the high definition. Specifically, what I would like to see done in our provision of television services is to do what the Advanced Television Systems Committee is trying to do today, and that is first to improve our current system in a compatible format and then to develop standards for high definition television that can be implemented in this country. ☆

European Cable Services Beam Coverage Maps

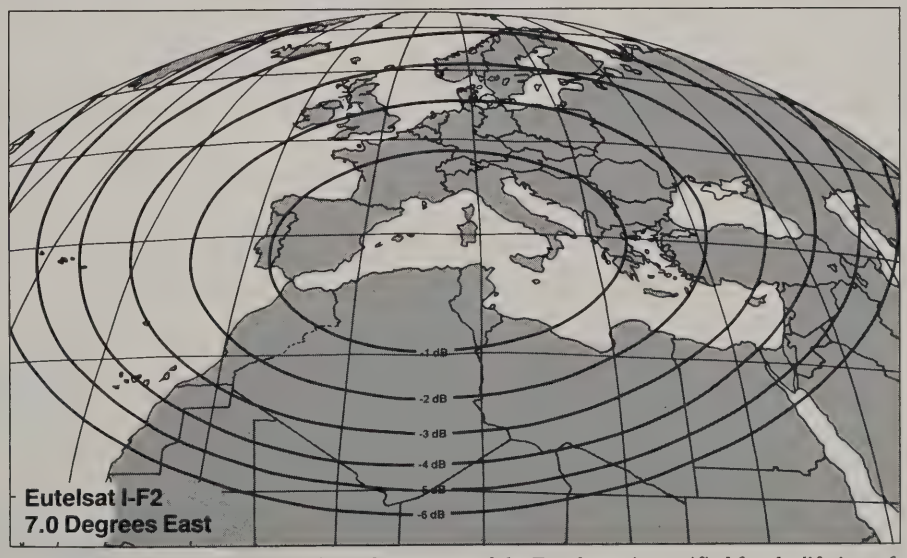
By using the following Ku-band margin-above-threshold chart (table 1) you can determine the right combination of antenna size and low noise block downconverter (LNB) noise figure to achieve a carrier-to-noise ratio (C/N) that is higher than the satellite receiver's threshold. To use the chart, you will need to first determine the effective isotropic radiated power (EIRP) level at your location by referring to the appropriate European Ku-band satellite footprint maps that follow.

Signal attenuation due to rainfall is an important factor that should be taken into consideration. Ku-band reception can be dramatically reduced due to the absorption or scattering of satellite signals as the microwaves pass through rain-filled layers of the atmosphere. Consequently, 11-GHz satellite TV receive terminals must have enough signal margin above the threshold level of the receiver to guarantee continuous, noise-free reception.

The margin level in decibels (dBs) selected by the terminal operator will vary, depending on the location of the receiving terminal and whether the earth station is being used for commercial or private use. Private terminal users may decide to accept a certain level of rain outages and use equipment with a low value of margin, or perhaps no margin at all. Commercial users' receiving terminals should deliver adequate reception even under the worst-case conditions.



The four west spot beam services all have a beam edge EIRP of 40 dBW.

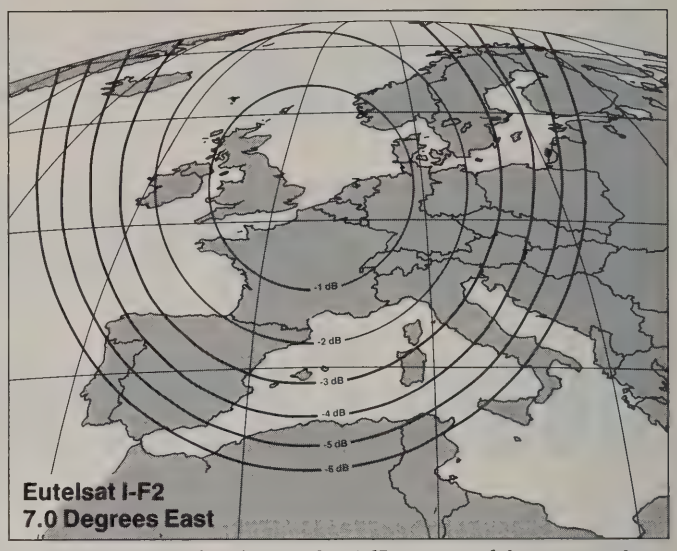


A minimum EIRP of 35 dBW at the -4 dB contour of the Eurobeam is specified for the lifetime of the satellite.

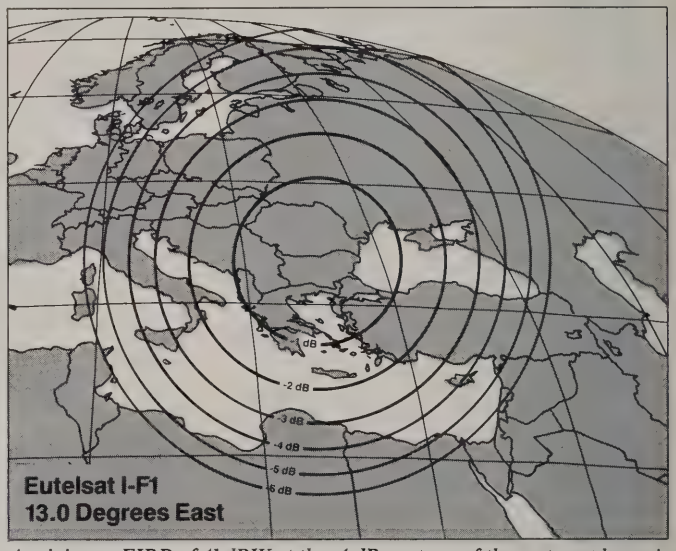
Antenna Size:	4 m 13 feet		4.8 m 16 feet		6 m 20 feet		7.6 m 25 feet		10 m 33 feet	
LNB N.T.:	2.45	3.45	2.45	3.45	2.45	3.45	2.45	3.45	2.45	3.45
LNB N.F.:	220	350	220	350	220	350	220	350	220	350
EIRP Level:										
55 dBW	+23.0	+21.1	+24.8	+22.9	+26.8	+24.8	+28.7	+26.8	+31.3	+29.2
54 dBW	+22.0	+20.1	+23.8	+21.9	+25.8	+23.8	+27.7	+25.8	+30.3	+28.2
53 dBW	+21.0	+19.1	+22.8	+20.9	+24.8	+22.8	+26.7	+24.8	+29.3	+27.2
52 dBW	+20.0	+18.1	+21.8	+19.9	+23.8	+21.8	+25.7	+23.8	+28.3	+26.2
51 dBW	+19.0	+17.1	+20.8	+18.9	+22.8	+20.8	+24.7	+22.8	+27.3	+25.2
50 dBW	+18.0	+16.1	+19.8	+17.9	+21.8	+19.8	+23.7	+21.8	+26.3	+24.2
49 dBW	+17.0	+15.1	+18.8	+16.9	+20.8	+18.8	+22.7	+20.8	+25.3	+23.2
48 dBW	+16.0	+14.1	+17.8	+15.9	+19.8	+17.8	+21.7	+19.8	+24.3	+22.2
47 dBW	+15.0	+13.1	+16.8	+14.9	+18.8	+16.8	+20.7	+18.8	+23.3	+21.2
46 dBW	+14.0	+12.1	+15.8	+13.9	+17.8	+15.8	+19.7	+17.8	+22.3	+20.2
45 dBW	+13.0	+11.1	+14.8	+12.9	+16.8	+14.8	+18.7	+16.8	+21.3	+19.2
44 dBW	+12.0	+10.1	+13.8	+11.9	+15.8	+13.8	+17.7	+15.8	+20.3	+18.2
43 dBW	+11.0	+9.1	+12.8	+10.9	+14.8	+12.8	+16.7	+14.8	+19.3	+17.2
42 dBW	+10.0	+8.1	+11.8	+9.9	+13.8	+11.8	+15.7	+13.8	+18.3	+16.2
41 dBW	+9.0	+7.1	+10.8	+8.9	+12.8	+10.8	+14.7	+12.8	+17.3	+15.2
40 dBW	+8.0	+6.1	+9.8	+7.9	+11.8	+9.8	+13.7	+11.8	+16.3	+14.2
39 dBW	+7.0	+5.1	+8.8	+6.9	+10.8	+8.8	+12.7	+10.8	+15.3	+13.2
38 dBW	+6.0	+4.1	+7.8	+5.9	+9.8	+7.8	+11.7	+9.8	+14.3	+12.2
37 dBW	+5.0	+3.1	+6.8	+4.9	+8.8	+6.8	+10.7	+8.8	+13.3	+11.2
36 dBW	+4.0	+2.1	+5.8	+3.9	+7.8	+5.8	+9.7	+7.8	+12.3	+10.2
35 dBW	+3.0	+1.1	+4.8	+3.8	+6.8	+4.8	+8.7	+6.8	+11.3	+9.2
34 dBW	+2.0	+0.1	+3.8	+2.8	+5.8	+3.8	+7.7	+5.8	+10.3	+8.2
33 dBW	+1.0	-0.9	+2.8	+1.8	+4.8	+2.8	+6.7	+4.8	+9.3	+7.2
32 dBW	0.0	-1.9	+1.8	+0.8	+3.8	+1.8	+5.7	+3.8	+8.3	+6.2
31 dBW	-1.0	-2.9	+0.8	-0.2	+2.8	+0.8	+4.7	+2.8	+7.3	+5.2
30 dBW	-2.0	-3.9	-0.2	-1.2	+1.8	-0.2	+3.7	+1.8	+6.3	+4.2
29 dBW	-3.0	-4.9	1.2	-2.2	+0.8	-1.2	+2.7	+0.8	+5.3	+3.2
28 dBW	-4.0	-5.9	-2.2	-3.2	-0.2	-2.2	+3.7	-0.2	+4.3	+2.2
27 dBW	-5.0	-6.9	-3.2	-4.2	-1.2	-3.2	+2.7	-1.2	+3.3	+1.2
26 dBW	-6.0	-7.9	-4.2	-5.2	-2.2	-4.2	+1.7	-2.2	+2.3	+0.2

Antenna Size:	.6m 2 feet		1.2m 4 feet		1.8m 6 feet		2.4m 8 feet		3m 10 feet	
LNB N.T.:	2.45	3.45	2.45	3.45	2.45	3.45	2.45	3.45	2.45	3.45
LNB N.F.:	220	350	220	350	220	350	220	350	220	350
EIRP Level:										
55 dBW	+6.7	+4.9	+12.7	+10.9	+16.3	+14.4	+18.8	+16.9	+20.7	+18.8
54 dBW	+5.7	+3.9	+11.7	+9.9	+15.3	+13.4	+17.8	+15.9	+19.7	+17.8
53 dBW	+4.7	+2.9	+10.7	+8.9	+14.3	+12.4	+16.8	+14.9	+18.7	+16.8
52 dBW	+3.7	+1.9	+9.7	+7.9	+13.3	+11.4	+15.8	+13.9	+17.7	+15.8
51 dBW	+2.7	+0.9	+8.7	+6.9	+12.3	+10.4	+14.8	+12.9	+16.7	+14.8
50 dBW	+1.7	-0.1	+7.7	+5.9	+11.3	+9.4	+13.8	+11.9	+15.7	+13.8
49 dBW	+0.7	-1.1	+6.7	+4.9	+10.3	+8.4	+12.8	+10.9	+14.7	+12.8
48 dBW	-0.3	-2.1	+5.7	+3.9	+9.3	+7.4	+11.8	+9.9	+13.7	+11.8
47 dBW	-1.3	-3.1	+4.7	+2.9	+8.3	+6.4	+10.8	+8.9	+12.7	+10.8
46 dBW	-2.3	-4.1	+3.7	+1.9	+7.3	+5.4	+9.8	+7.9	+11.7	+9.8
45 dBW	-3.3	-5.1	+2.7	+0.9	+6.3	+4.4	+8.8	+6.9	+10.7	+8.8
44 dBW	-4.3	-6.1	+1.7	-0.1	+5.3	+3.4	+7.8	+5.9	+9.7	+7.8
43 dBW	-5.3	-7.1	+0.7	-1.1	+4.3	+2.4	+6.8	+4.9	+8.7	+6.8
42 dBW	-6.3		-0.3	-2.1	+3.3	+1.4	+5.8	+4.8	+7.7	+5.8
41 dBW	-7.3		-1.3	-3.1	+2.3	+0.4	+4.8	+3.8	+6.7	+4.8
40 dBW			-2.3	-4.1	+1.3	-0.6	+3.8	+2.8	+5.7	+3.8
39 dBW			-3.3	-5.1	+0.3	-1.6	+2.8	+1.8	+4.7	+2.8
38 dBW			-4.3	-6.1	-0.7	-2.6	+1.8	+0.8	+3.7	+1.8
37 dBW			-5.3	-7.1	-1.7	-3.6	+0.8	-0.2	+2.7	+0.8
36 dBW			-6.3		-2.7	-4.6	-0.2	-1.2	+1.7	-0.2
35 dBW			-7.3		-3.7	-5.6	-1.2	-2.2	+0.7	-1.8
34 dBW					-4.7	-6.6	-2.2	-3.2	-0.3	-2.8
33 dBW					-5.7	-7.6	-3.2	-4.2	-1.3	-3.8
32 dBW					-6.7		-4.2	-5.2	-2.3	-4.8
31 dBW					-7.7		-5.2	-6.2	-3.3	-5.8
30 dBW							-6.2	-7.2	-4.3	-6.8

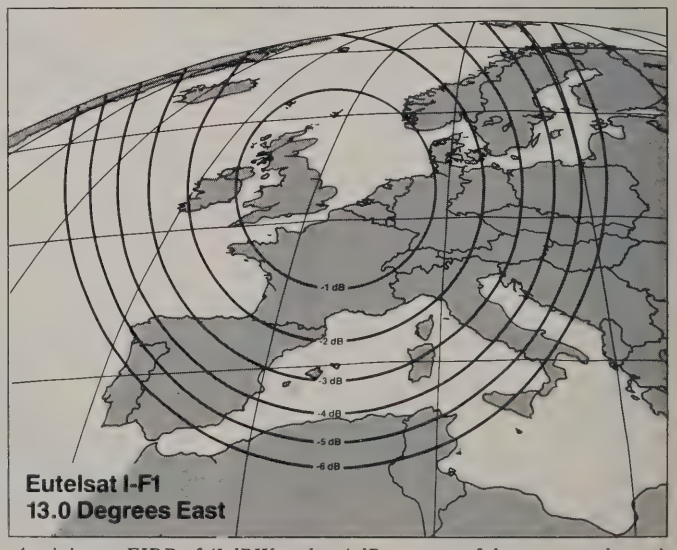
Table 1. Ku-band Margin-above-threshold Chart



A minimum EIRP of 41 dBW at the -4 dB contour of the west spot beam is specified for the lifetime of the satellite.



A minimum EIRP of 41 dBW at the -4 dB contour of the east spot beam is specified for the lifetime of the satelllite.



A minimum EIRP of 41 dBW at the -4 dB contour of the west spot beam is specified for the lifetime of the satellite.

European Cable Programming

EUTELSAT-1 F1 (13.0 Degrees E)

Tr. #	Beam	Service	BW☆	Frequency	Video Pol.	Standard	Descrambler Required?	Audio Format	Video Deviation	Audio Deviation	Audio Pre-emphasis	Beam-Edge EIRP
1	West Spot	**Radio Televisione Italiana (RAI)** —Italy	36	11.005 GHz	[H]	PAL	No	6.6 MHz S/C	25 MHz	N/A	N/A	41 dBW
2	East Spot	**3 Sat** —Germany	36	11.057 GHz	[H]	PAL	No	S/C	25 MHz	—	—	41 dBW
3	West Spot	**Europa** —Holland	30	11.1750 GHz	[H]	PAL	No	6.6 MHz S/C	20 MHz	50 kHz	50 μs	41 dBW
4	West Spot	**TV5** —France	36	11.472 GHz	[H]	SECAM	No	6.65 MHz S/C	25 MHz	75 kHz	△	41 dBW
4	West Spot	**New World Channel** —Norway	36	11.4720 GHz	[H]	SECAM	Yes ◊	6.65 MHz S/C	25 MHz	150 kHz	△	41 dBW
4	West Spot	**WorldNet**—US	36	11.512 GHz	[H]	PAL	No	6.65 MHz S/C	25 MHz	75 kHz	△	41 dBW
6	West Spot	**Sky Channel** —UK	27	11.6500 GHz	[H]	PAL	Yes ★	6.65 MHz mono; 7.02/7.20 stereo S/C	16 MHz	50 kHz	50 μs	41 dBW
7	West Spot	**Teleclub** —Switzerland	36	10.98666 GHz	[V]	PAL	No	6.5 MHz S/C	25 MHz	75 kHz	75 μs	41 dBW
8	East Spot	**RTL-Plus** —Luxembourg	—	11.087 GHZ	[V]	PAL	No	S/C	—	—	—	41dBW
9	West Spot	**FilmNet/ATN** —Belgium	30	11.1403 GHz	[H]	PAL	No	6.65 MHz S/C	19 MHz	75 kHz	△	41 dBW
10	West Spot	**Sat-1**—Germany	36	11.5070 GHz	[V]	PAL	No	S/C	25 MHz	—	—	41 dBW
12	West Spot	**Music Box**—UK	36	11.6740 GHz	[V]	PAL	No	6.65 mono; 7.02/7.20 stereo S/C	25 MHz	50 kHz	50 μs	41 dBW

EUTELSAT-1 F2 (7.0 Degrees E)

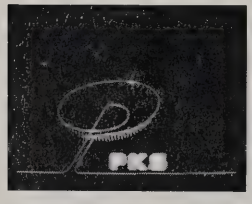
2	East Spot	**WorldNet**—U.S.	36	11.093 GHz	[H]	SECAM	No	6.65 MHz S/C	25 MHz	75 kHZ	△	41 dBW
3	Eurobeam	**Eurovision (EBU)**	36	11.1760 GHz	[H]	PAL	Yes ♦	Sound-in-sync ◊	—	—	—	36 dBW
6	West Spot	**NRK TV Norge** —Norway	36	11.642 GHz	[H]	C-MAC	Yes ♦	—	—	—	—	41 dBW
9	Eurobeam	**Eurovision (EBU)**	36	11.1420 GHz	[V]	PAL	Yes ◊	Sound-in-sync ◊	—	—	—	36 dBW
10	West Spot	**SVT-1** —Sweden	—	11.468 GHz	[V]	PAL	Yes	—	—	—	—	41 dBW
12	West Spot	**SVT-2** —Sweden	—	11.635 GHz	[V]	PAL	Yes	—	—	—	—	41 dBW

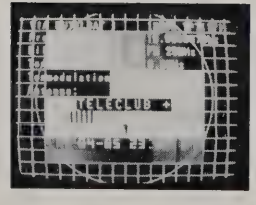
INTELSAT VA F11 (27.5 Degrees W)

2W	West Spot	**Premiere**—UK	30	11.0150 GHz	[H]	PAL	No	6.6 MHz S/C	20 MHz	50 kHz	50 μs	40 dBW
2W	West Spot	**The Children's Channel**—UK	30	11.0150 GHz	[H]	PAL	No	6.6 MHz S/C	20 MHz	50 kHz	50 μs	40 dBW
2E	East Spot	**Cable News Network**—US	30	11.1550	[V]	PAL	No	6.6 MHz	20 MHz	50 kHz	50 μs	41 dBW
3W	West Spot	**Screen Sport**—UK	30	11.1350 GHz	[H]	PAL	No	6.65 MHz S/C	20 MHz	50 kHz	50 μs	40 dBW
4W	West Spot	**MirrorVision**—UK	30	11.1750 GHz	[H]	PAL	No	6.6 MHz S/C	20 MHz	50 kHz	50 μs	40 dBW

Video and audio encoded via the C-MAC video standard.
☆ in MHz
♦ Uses the EBU/BBC sound-in-sync encoding system. Video is unencrypted.
Services employing the following scrambling systems have announced plans to discontinue scrambling in the near future.
★ Uses the Oak/Racal video scrambling system. Audio is clear.
▲ Uses the Standard Electric Lorentz (SEL) PCM2 sound-in-sync encoding system. Video is unencrypted.
◊ Uses the RTC Discret video scrambling system. Audio is clear.
△ = CCITT audio standard.
t.b.a. = to be announced.

European Cable Programmers





Eutelsat-1 F1 at 13 Degrees East

Tr.#	Service	Uplinking Country	Operating Category
1	**Radio Televisione Italiana (RAI):** The Italian public TV network no. 1.	Italy	News/ Sports/ Variety
2	**3-Sat:** German-language entertainment service features programs from the German ZDF, Austrian ORF, and Swiss SRG TV networks.	W. Germany	News/ Sports/ Variety
3	**Europa:** This pan-European entertainment service provides original program material and feeds from Eurovision and selections from the catalogs of EBU member stations.	Netherlands	News/ Variety
4	**TV-5:** French-language program service offers contributions from the French TF 1, FR3, and Antenna 2 networks as well as programs developed by the Swiss SSR and Belgian RTFB TV services.	France	Variety/ Educational
4	**New World Channel:** A multilingual religious program service.	Norway	Religious
4	**WorldNet:** News, documentaries, and educational programming from the U.S. Information Agency.	US	News
6	**SkyChannel:** English-language family entertainment network provides children's programming, pop music videos, popular American TV series, sports events, movies, and documentaries.	UK	Music/ Sports/ Variety
7	**Teleclub (Paysat):** Premium movie service operated by Swiss Rediffusion and Taurus/Beta films of Munich.	Switzerland	Movies
8	**Radio-Tele-Luxembourg (RTL+):** Luxembourg German-language public TV channel 7 in Luxembourg features news, entertainment, and American TV serials and films.	Luxembourg	News/ Variety
9	**FilmNet/ATN:** Premium movie service offers first-run films and movie classics from around the globe.	Belgium	Movies
9	**World Public News (WPN)**	Belgium	News
10	**Sat 1:** German cable TV service has variety shows, documentaries, series, and film classics.	W. Germany	Variety
12	**Music Box:** Pop music video entertainment service offers concerts, concert tour guides, music news and interviews, and the latest European charts.	UK	Pop Music

Eutelsat-1 F2 at 7 Degrees East

2	**WorldNet****	----	----
10	**SVT-1:** Swedish TV.	Sweden	----
12	**SVT-2:** Swedish TV.	Sweden	----
6	**NRK TV-Norge:** Norwegian public TV channel originates from Oslo, Norway.	Norway	News/ Sports Variety
3 & 9	**Eurovision:** News, sports and entertainment exchanges between EBU member stations *	EBU	News

Intelsat VA-F11 at 27.5 Degrees West

2W	**Premiere:** British-based premium movie service	UK	Movies
2W	**The Children's Channel:** Entertainment for children and their parents.	UK	Children
2E	**Cable News Network (CNN):** Live round-the-clock international news coverage, investigative reporting, sports, weather, interviews, and financial news. Scheduled to start late in 1985. *	US	News
3W	**Screen Sport:** British sports, network features professional, collegiate and amateur sporting events from around the world.	UK	Sports
4W	**MirrorVision:** English-language premium movie and entertainment network.	UK	Movies

★ UK Summer Time
♦ Services scheduled to be operational by July 1985.
** Same programmer as Eutelsat 1-F1 WorldNet service.
▲ Services scheduled to be operational by September 1985.
* Services available only to EBU member stations.
N/A = not available

Programming Hours ★	Programming Contact	Address	Advertiser-Supported?	Subscription Rate	Cable Subscribers
12:00 – 24:00	Vitorio Bono Telephone: (+ 39 6) 36861	Direzione Centrale TV Viale Mazzini 14, 00195 Rome, Italy	Yes	Free	N/A
18:00 – 24:00	Dr. Volker V. Hogen Coordinator 3-Sat Telephone: (+ 49 6131) 701	Postfach 4040 6500 Mainz 1, West Germany	No	Free	N/A
11:00 Tests	Paul Hendrickson Telephone: (+ 31 35) 779 111	P.O. Box 10, NL-1200 JB Hilversum, The Netherlands	Yes	Free	----
19:00 – 22:30	Jean Rouilly Telephone: (+ 33 1) 299 41 25	21, rue Jean Goujon 78005 Paris, France	No	Free	2,000,000
11:00 – 12:00 14:00 – 15:00 22:40 – 23:40	Trond Rauoe Vice President of Sales Telephone: (+ 47 2) 46 28 60	EBN A/S Lybekkergt. 1 0184 Oslo, Norway	No	Free	250,000
12:00 – 14:00	Richard Levy Alvin Snyder Telephone: (202) 376-7806	U.S. Information Agency 301 4th St. SW Washington, D.C. 20547	No	Free	----
07:45—24:00 M-F, 07:00—24:00 Sat-Sun	Richard Platt Director of Sales Telephone: (+ 44 1) 636 4077	Satellite Television PLC 31-36 Foley St. London W1P 7LB UK	Yes	Free	4,400,000
19:15 – 24:00 M-F; 17:00 – 24:00 Sat-Sun	Pierre Meyrat Telephone: (+ 41 1) 492-4433	Flueastrasse 7, Postfach CH-8048 Zurich, Switzerland	No	SFr. 28,00	267,545
17:00 – 24:00	Helmut Thoma Director Telephone: (+ 352) 44 90 41	Villa Louvigny BP 1002 Luxembourg	Yes	Free	----
18:00 – 01:00	Martin Lindskogh Telephone: (+ 32 20) 06 03 03	Keizersgracht 319 1016 EE Amsterdam, The Netherlands	No	HFl. 30,00	20,000
10:00 – 12:00 14:00 – 18:00	Marc de Cock Telephone: (+ 32) 50 34 02 12	I.T.S. Ezelstraat 1, 8000 Brugge, Belgium	No	N/A	----
13:30 – 24:00	Jurgen Doetz Telephone: (+ 49 69) 74 77 66	Friedrich Ebert Anlage 2-14 6000 Frankfort 1, West Germany	Yes	Free	214,000
07:00 – 0:100	Marcus Bicknell Director of Sales Telephone: (+ 44) 1 580 6611	Central Cross House 2 Stephen St., London W1A 4PL UK	Yes	Free	2,500,000
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16:55 – 22:00	S. Torjusson Director of Sales Telephone: (+ 47 02) 459050	Norsk Rikskringkasting TV Oslo 3, Norway	N/A	N/A	N/A
12:00 & 17:00	R. Gressmann Director Telephone: (+ 32 02) 375 59 90	European Broadcasting Union Technical Center Av. Albert Lancaster, 32 B-1180 Bruxelles, Belgium	----	----	----
15:00 – 03:00 M-Sun;	Frank Dawson Network Relations Telephone: (+ 44) 1 580 6611	Galaxy Television Thorn EMI, Central Cross House 2 Stephen St., London W1A 4PL UK	No	£ 7.50	N/A
07:00 – 15:00	Martin Gregory Head of Marketing Telephone: (+ 44) 1 580 6611	Galaxy Television Thorn EMI, Central Cross House 2 Stephen St., London W1A 4PL UK	Yes	30p—60p	120,000
24 hours	Charles Bonan Managing Director Telephone: (+ 44) 1 631 5278	Turner Programme Services 66 – 67 Newman Street London WIP 3LA UK	----	----	----
17:00 – 22:50 M-F; 16:00 – 23:00 Sat-Sun	Chris B. Howland Sales Director Telephone: (+ 44) 1 222 0855	23 Queen Anne's Gate London SW1H 9BU UK	No	N/A	110,000
16:00 – 01:00	Ward Thomas Telephone: (+ 44) 1 930 7810	United Cable Programmes Ltd. 48 Leicester Square, London WC2H 7LZ UK	No	£ 7.95	50,000

(NOTE: Submit changes in writing to: *Satellite World* magazine, P.O. Box 53, Boise, Idaho 83707, U.S.A. Closing date is the 1st of the second month preceding issue date.)

Atlantic Ocean Region

INTELSAT IVA

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
I-IVA—F11	27.5 W	5	East Hemi	Half	RH-3798	**Radiodiffusion Television Marocaine TV**—Marocaine TV	3821.12 MHz/ SCPC	22 dBW
I-IVA—F11	27.5 W	13	East Hemi	Half	RH-3965	**Libya**	6.2 MHz S/C	22 dBW
I-IVA—F11	27.5 W	20	Global Beam	Full	RH-4095	**Argentina**	Non-video lease	24 dBW
I-IVA—F11	27.5 W	24	Global Beam	Full	RH-4175	**Argentina Televisora Color (ATC)**—Channel 7, Buenos Aires	6.4 MHz S/C	23 dBW
I-IVA—F04	21.5 W	1	East Hemi	Full	RH-3725	**Saudi Arabian Television**	3901.75 MHz/SCPC	23 dBW
I-IVA—F04	21.5 W	5	East Hemi	Half	RH-3795	**Tele-Sahel**—TV Niger	3822.625 MHz/SCPC	17 dBW
I-IVA—F04	21.5 W	9	East Hemi	Full	RH-3885	**Saudi Arabia**	Non-video lease	—
I-IVA—F04	21.5 W	11	Global Beam	Full	RH-3925	**Embratel**—Brazil occasional video	5.8 MHz S/C	19 dBW
I-IVA—F04	21.5 W	13	East Hemi	Full	RH-3965	**Sudan Television**	3992.25 MHz/SCPC	20 dBW
I-IVA—F04	21.5 W	17	East Hemi	Half	RH-4045	**Zaire Television**	4071.825 MHz/SCPC	19 dBW

INTELSAT V

I-V—F08	53.0 W	18	Global Beam	Half	RH-4065	**Denmark**—Radio Denmark	4049.625 MHz/SCPC	—
I-V—F08	53.0 W	22	Global Beam	Half	RH-4135	**TV Chile, Santiago, Channel 7**	SCPC	19 dBW
I-V—F04	34.5 W	11	East Zone	Half	LH-3930	**TVE 1**—Spain	6.6 MHz S/C	18 dBW
I-V—F04	34.5 W	15	East Hemi	Half	RH-4010	**TVE 2**—Spain	6.6 MHz S/C	15 dBW
I-V—F04	34.5 W	22	Global Beam	Half	RH-4135	**UK – USA**—International Television lease (WorldNet)	—	—
I-V—F04	34.5 W	24	Global Beam	Full	RH-4177.5	**International Video News Feeds**	—	Varies 17 – 24 dBW
I-V—F06	18.5 W	22	Global Beam	Full	RH-4135	**France**	Non-video lease	—
I-V—F06	18.5 W	24	Global Beam	Half/Full	RH-4177.5	**Occasional Video**—Major international news feeds	—	Varies 17 – 24 dBW
I-V—F02	1.0 W	7	Global Beam	Full	RH-3845	**Norway**	Non-video lease	—
I-V—F02	1.0 W	9	East Hemi	Full	RH-3885	**AFRTS—Southern Europe Broadcasting TV**	S/C	26dBW
I-V—F02	1.0 W	18	Global Beam	Half	RH-4065	**BrightStar**—Independent international satellite system providing video services between USA and UK	6.625 MHz S/C	18dBW
I-V—F02	1.0 W	19	Global Beam	Full	RH-4085	**Portugal TV**	6.6 MHz S/C	18dBW
I-V—F02	1.0 W	22	Global Beam	Full	RH-4135	**Portugal**	Non-video lease	—
I-V—F02	1.0 W	24	Global Beam	Full	RH-4175	**American Forces Radio and Television Service**—Provides live American programming to servicemen abroad	6.8 MHz S/C	20dBW
I-V—F07	60.0 E	24	Global Beam	Half/Full	RH-4177.5	**International News Feeds**	—	Varies 17 – 24 dBW
I-V—F05	63.0 E	10	West Hemi	Half	RH-3905	**France**	Non-video lease	—
I-V—F05	63.0 E	24	Global Beam	Half/Full	RH-4177.5	**Occasional Video**—European and Australian news feeds	—	Varies 17 – 24 dBW

INTELSAT VA

I-VA—F10	24.5 W	7	East Spot	Full	V-11.485	**WorldNet**—TV service of the U.S. Information agency	S/C	39dBW
I-VA—F10	24.5 W	24	Global Beam	Half/Full	RH-4177.5	**Occasional Video**—Major international news feeds	—	Varies 17 – 24 dBW
I-VA—F12	57.0 E	1W	West Spot	Full	H-10992.5	**Occasional Video**— West Germany	S/C	—
I-VA—F12	57.0 E	3W	West Spot	Full	H-11155	**SAT 1**—West Germany	S/C	—
I-VA—F12	57.0 E	5	East Hemi	Full	RH-3805	**India**	Non-video lease	—
I-VA—F12	57.0 E	8W	West Spot	Full	H-11577.5	**Occasional Video**— West Germany	S/C	—
I-VA—F12	57.0 E	8	East Hemi	Full	RH-3855	**RTM-TV**—Malaysia	6.6 MHz S/C	—
I-VA—F12	57.0 E	9	West Hemi	Half	RH-3875	**Television Algerie**	SCPC	26 dBW

INTELSAT VA

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
I-VA—F12	57.0 E	10	East Hemi	Full	RH-3905	**TV Shanghai**—China	6.6 MHz S/C	—
I-VA—F12	57.0 E	14	West Hemi	Half	RH-3975	**Nigerian Television**	—	16 dBW
I-VA—F12	57.0 E	16	East Hemi	Quarter	RH-3995	**Thailand**	Non-video lease	—
I-VA—F12	57.0 E	18	West Hemi	Full	RH-4055	**Nigeria TV**	Non-video lease/ SCPC	21 dBW
I-VA—F12	57.0 E	20	Global Beam	Full	RH-4085	**Oman Television**	SCPC	19 dBW
I-VA—F12	57.0 E	22	Global Beam	Full	RH-4135	**Nigeria**	Non-video lease	—

MOLNIYA

MOLNIYA 3	Non-Geo-synch.	9	Northern Global Beam	Full	RH-3875	**II Programma**—Soviet Television, Moscow	Sound-in-sync	31 dBW

GORIZONT

GORIZONT 7	14.0 W		Spot Beam	Full	11.512 GHz	**Occasional I Programma Video**—Soviet Television, Moscow	7.0 MHz S/C	—
GORIZONT 7	14.0 W	–1	Spot Beam	Full	RH-3675	**I Programma**—Soviet Television, Moscow	7.0 MHz S/C with audio companding	22 dBW (Americas) 46 dBW (Europe)
GORIZONT 7	14.0 W	1	Global Beam	Full	RH-3725	**Occasional Video**	7.5 MHz S/C	28 dBW
GORIZONT 7	14.0 W	4	North Hemi	Full	RH-3775	**Non-video SCPC Telephony**— Radio Moscow at 3778.975 MHz	—	—
GORIZONT 7	14.0 W	6	Global Beam	Full	RH-3825	**Intersputnik and O.I.R.T. TV Program exchanges**	7.5 MHz S/C	28 dBW
GORIZONT 7	14.0 W	9	North Hemi	Full	RH-3875	**Non-video wideband digital signals**	—	—
GORIZONT 7	14.0 W	11	North Hemi	Full	RH-3925	**Non-video narrowband digital signals**	—	—
GORIZONT 9	53.0 E	–1	Spot Beam	Full	RH-3675	**I Programma**—Soviet Television, Moscow (Orbita-4 version)	7.0 MHz S/C with audio companding	17 dBW (Europe) 46 dBW (Asia)
GORIZONT 9	53.0 E	4	North Hemi	Full	RH-3775	**Non-video SCPC Telephony**	—	—
GORIZONT 9	53.0 E	6	Zone Beam	Full	RH-3825	**Non-video wideband digital signals**	—	—
GORIZONT 9	53.0 E	9	North Hemi	Full	RH-3875	**II Programma**—Soviet Television, Moscow (Orbita-4 version)	Sound-in-sync	—
GORIZONT 9	53.0 E	11	North Hemi	Full	RH-3925	**Non-video wideband digital signals**	—	—
GORIZONT 10	80.0 E	–1	Spot Beam	Full	RH-3675	**II Programma**—Soviet Television, Moscow (Orbita-4 version)	7.0 MHz S/C	—
GORIZONT 10	80.0 E	9	North Hemi	Full	RH-3875	**I Programma**—Soviet Television, Moscow (Orbita-4 version)	7.5 MHz S/C	—
GORIZONT 8	90.0 E	–1	Spot Beam	Full	RH-3675	**II Programma**—Soviet Television, Moscow (Orbita-2 version)	7.0 MHz S/C with audio companding	—
GORIZONT 8	90.0 E	9	North Hemi	Full	RH-3875	**I Programma**—Soviet Television, Moscow (Orbita-2 version)	Sound-in-sync	—

TELECOM

TELECOM F1	8.0 W	1	Semi-Global	Full	LH-3710	**AITV, Agence d'Images Television Francaise, News**—Paris	6.6 MHz S/C	24 dBW
TELECOM F1	8.0 W	4	Spot Beam	Full	LH-3780	**Non-video TDMA Telephony**	—	—
TELECOM F1	8.0 W	7	Spot Beam	Full	LP-12690	**Occasional Video**	—	40 dBW
TELECOM F1	8.0 W	6	Spot Beam	Full	LP-12732	**Occasional Video**	—	40 dBW
TELECOM F2	5.0 W	3	Spot Beam	Full	LP-12.606	**Occasional Video**	—	40 dBW
TELECOM F2	5.0 W	4	Spot Beam	Full	LP-12.648	**Occasional Video**	—	40 dBW
TELECOM F2	5.0 W	7	Spot Beam	Full	LP-12.690	**Occasional Video**	—	40 dBW
TELECOM F2	5.0 W	6	Spot Beam	Full	LP-12.732	**Occasional Video**	—	40 dBw

ARABSAT

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
ARABSAT 1B	26.0° E	23	Spot Beam	Full	RH-4125	**Occasional Video**	6.6 MHz S/C	21 dBW
ARABSAT 1B	26.0° E	S*	Spot Beam	Full	LP-2634	**Channel 5 Riyadh**—Saudi Arabia	6.6 MHz S/C	—

INSAT

INSAT 1-B	74.0 E	24	Spot Beam	Full	LP-4180	**TV India**	S/C	—
INSAT 1-B	74.0 E	S*	Spot Beam	Full	LP-2575	**TV India**	—	—
INSAT 1-B	74.0 E	S*	Spot Beam	Full	LP-2615	**TV India**	—	—

Satellite Services
The Americas

ANIK

ANIK C3	117.5°W	8	W. & W. Central Can. spot	Half	V-11926	**The Knowledge Network**—Canadian educational programming—Canada	5.4 MHz S/C	16.6 dBW
ANIK C3	117.5°W	9	W. & W. Central Can. Spot	Half	V—11961	**Access Alberta**—Educational programming—Canada	5.4 MHz S/C	16.6 dBW
ANIK C3	117.5°W	10	W. & W. Central Can. Spot	Half	V—11987	**Premier Choix/TVEC**—West Movies, sports, and specials in French—Canada	5.4 MHz S/C	23.6 dBW
ANIK C3	117.5°W	12	W. & W. Central Can. Spot	Half	V—12048	**Superchannel/First Choice** Movies, sports, and specials in English—Canada	5.4 MHz S/C	20.6 dBW
ANIK C3	117.5°W	17	E. & E. Central Can. Spot	Half	H—11730	**Atlantic Satellite Network** CTV network programming—Canada	5.4 MHz S/C	20.6 dBW
ANIK C3	117.5°W	19	E. & E. Central Can. Spot	Half	H—11791	**Premier Choix/TVEC**—East Movies, sports, and specials in French—Canada	5.4 MHz S/C	20.6 dBW
ANIK C3	117.5°W	24	E. & E. Central Can. Spot	Half	H—11939	**La Sette**—programming from France, distributed in—Canada	5.4 MHz S/C	16.6 dBW
ANIK C3	117.5°W	26	E. & E. Central Can. Spot	Half	H—12000	**TVOntario**—Educational programming—Canada	5.4 MHz S/C	16.6 dBW
ANIK C3	117.5°W	31	E & E. Central Can. Spot	Half	H—12157	**Superchannel/First Choice —East**—Movies, sports, and specials in English—Canada	5.4 MHz S/C	16.6 dBW
ANIK C3	117.5°W	32	E. & E. Central Can. Spot	Half	H—12183	**Radio Quebec**—Educational programming—Canada	5.4 MHz S/C	16.6 dBW
ANIK D1	104.5°W	2	North America	Full	V—3740	**TSN (The Sports Network)**—Sports programming—Canada	6.8 MHz S/C	35 dBW
ANIK D1	104.5°W	4	North America	Full	V—3780	**Global Television**—Daily news, sports and network feeds—Canada	6.8 MHz S/C	35 dBW
ANIK D1	104.5°W	6	North America	Full	V—3820	**MuchMusic**—Rock music videos —Canada	Stereo 5.41/6.17 MHz S/C	33 dBW
ANIK D1	104.5°W	8	North America	Full	V—3860	**CHCH**—Hamilton, Ontario Variety programming—Canada	Digital audio compressed in the VBI	35 dBW
ANIK D1	104.5°W	9	North America	Full	H—3880	**WDIV**—Detroit—U.S.A.—NBC live/taped programming—U.S.A.	Digital audio compressed in the VBI	33 dBW
ANIK D1	104.5°W	10	North America	Full	V—3900	**WXYZ**—Detroit—U.S.A.—ABC live/taped programming—U.S.A.	Digital audio compressed in the VBI	35 dBW
ANIK D1	104.5°W	11	North America	Full	H—3920	**CBC—North—Pacific**—Canadian variety programming in English—U.S.A.	6.8 MHz S/C	33 dBW

ANIK (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
ANIK D1	104.5°W	14	North America	Full	V—3980	**TCTV (Telemedia Com. TV)**—TVA network variety programs—Canada	Digital audio compressed in the VBI	35 dBW
ANIK D1	104.5°W	15	North America	Full	H—4000	**CBC—French—Eastern**—Network programming in French—Canada	6.8 MHz S/C	33 dBW
ANIK D1	104.5°W	16	North America	Full	V—4020	**Canadian Parliamentary Network**—Public affairs programming in French—Can.	6.8 MHz S/C	35 dBW
ANIK D1	104.5°W	18	North America	Full	V—4060	**CITV**—Edmonton, Alberta—Variety programming in English—Canada	Digital audio compressed in the VBI	35 dBW
ANIK D1	104.5°W	19	North America	Full	H—4080	**CBC—North—Eastern**—Network programming in English—Canada	6.8 MHz S/C	33 dBW
ANIK D1	104.5°W	20	North America	Full	V—4100	**CBC—Montreal**—Network programming in English—Canada	6.8 MHz S/C	35 dBW
ANIK D1	104.5°W	21	North America	Full	H—4120	**WTVS**—Detroit—U.S.A.—PBS affilate feeds and variety programming—U.S.A.	Digital audio compressed in the VBI	33 dBW
ANIK D1	104.5°W	22	North America	Full	V—4140	**BCTV**—Vancouver B.C.—Can. CTV affiliate feeds and variety programming—Can.	Digital audio compressed in the VBI	35 dBW
ANIK D1	104.5°W	23	North America	Full	H—4160	**WJBK**—Detroit—U.S.A.—CBS live/taped programming—U.S.A.	Digital audio compressed in the VBI	33 dBW
ANIK D1	104.5°W	24	North America	Full	V—4180	**Canadian Parliamentary Network**—publics affairs in English—Canada	6.8 MHz S/C	35 dBW
ANIK D1	104.5°W	24	North America	Full	V—4180	**CBC—North—Eastern**—Canadian network programming in French—Canada	6.8 MHz S/C	35 dBW

AURORA

AURORA 1	143.0°W	20	North America & Hawaii	Full	H-4100	**Learn/Alaska Television Network**—Educational programming—U.S.A.	5.8 MHz S/C	N.A.: 32.1 dBW Hawaii: 27.1 dBW
AURORA 1	143.0°W	24	North America & Hawaii	Full	H-4180	**Alaska Satellite Television Project**—Variety programming—U.S.A.	5.8 MHz S/C	N.A.: 32.1 dBW Hawaii: 27.1 dBW

GALAXY

GALAXY 1	134.0°W	2	N. America & Hawaii Spot	Full	V-3740	**TNN (The Nashvillle Network)** Country-Variety—U.S.A.	Stereo 5.58/5.76 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	3	N. America & Hawaii Spot	Full	H-3760	**WGN—Chicago**—Variety programming—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	4	N. America & Hawaii Spot	Full	V-3780	**The Disney Channel—East** Family Entertainment—U.S.A.	Stereo 5.8/6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	5	N. America & Hawaii Spot	Full	H-3800	**Showtime—East** Movies, sports, specials—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	6	N. America & Hawaii Spot	Full	V-3820	**SIN (Spanish International Network)** Spanish-language programming—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	7	N. America & Hawaii Spot	Full	H-3840	**CNN (Cable News Network)** News coverage and features—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	8	N. America & Hawaii Spot	Full	V-3860	**CNN Headline News**—Continuously updated coverage—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW

GALAXY (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
GALAXY 1	134.0°W	9	N. America & Hawaii Spot	Full	H-3880	**ESPN**—Professional, college, and amateur sports—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	10	N. America & Hawaii Spot	Full	V-3900	**TMC (The Movie Channel)—East**—Movies—U.S.A.	Stereo 5.8/6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	11	N. America & Hawaii Spot	Full	H-3920	**CBN Cable Network**—Family Christian entertainment—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 25 dBW
GALAXY 1	134.0°W	12	N. America & Hawaii Spot	Full	V-3940	**Request TV**—Movies on a pay-per-view basis—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	13	N. America & Hawaii Spot	Full	H-3960	**C-SPAN**—U.S.public affairs—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	14	N. America & Hawaii Spot	Full	V-3980	**TMC (The Movie Channel)—West**—Movies—U.S.A.	Stereo 5.8/6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	15	N. America & Hawaii Spot	Full	H-4000	**WOR—New York**—Variety—programming—U.S.A.	6.8 MHz S/C	CONUS: 35 dBW Hawaii: 29 dBW
GALAXY 1	134.0°W	17	N. America & Hawaii Spot	Full	H-4040	**PTL Satellite—The Inspirational Network**—Religious programming—U.S.A.	Stereo 5.58/5.76 MHz S/C	CONUS: 35 dBW Hawaii: 29 dBW
GALAXY 1	134.0°W	18	N. America & Hawaii Spot	Full	V-4060	**WTBS—Atlanta**—Variety and family programming—U.S.A.	Stereo 5.58/5.76 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	19	N. America & Hawaii Spot	Full	H-4080	**Cinemax—East**—Movies, sports, and specials—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	20	N. America & Hawaii Spot	Full	V-4100	**Galavision**—Spanish-language programming—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	21	N. America & Hawaii Spot	Full	H-4120	**USA Cable Network—East**—Variety programming—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	22	N. America & Hawaii Spot	Full	V-4140	**The Discovery Channel**—Science, educational, and variety programming—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	21	N. America & Hawaii Spot	Full	V-4140	**AVN (Alternate View Network)**—Educational and religious programming—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 1	134.0°W	23	N. America & Hawaii Spot	Full	H-4160	**HBO (Home Box Office)—East**—Movies, sports, and specials—U.S.A.	6.8 MHz S/C	N.A.: 29 dBW Hawaii: 35 dBW
GALAXY 1	134.0°W	24	N. America & Hawaii Spot	Full	V-4180	**The Disney Channel—West**—Family entertainment—U.S.A.	Stereo 5.8/6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW
GALAXY 3	093.5°W	8	N. America & Hawaii Spot	Full	V-3860	**Senate Republican Conference News**—U.S. political programming—U.S.A.	6.8 MHz S/C	N.A.: 28 dBW Hawaii: 34 dBW

GSTAR

GSTAR A1	103.0°W	5	CONUS	Half	H—11959	**NTU (National Technological University)**—Educational programming—U.S.A.	6.8 MHz S/C	31 dBW
GSTAR A1	103.0°W	5	CONUS	Half	H—11989	**AMCEE—Educational** programming—U.S.A.	6.8 MHz S/C	31 dBW
GSTAR A1	103.0°W	7	CONUS	Half	H—12.080	**Campus Satellite Network**—Variety programming for college campus distribution—U.S.A.	6.8 MHz S/C	34 dBW
GSTAR A1	103.0°W	10	CONUS	Half	V—11789	**ESPN**—Professional, college and amateur sporting events—U.S.A.	N/A	31 dBW
GSTAR A1	103.0°W	10	CONUS	Half	V—11820	**CNN Headline News**—Continuously updated news coverage—U.S.A.	N/A	31 dBW

GSTAR (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
GSTAR A1	103.0°W	12	East U.S. Regional Spot	Half	V—11912	**Showtime—East**—Movies, sports, and specials—U.S.A.	N/A	32 dBW
GSTAR A1	103.0°W	12	East U.S. Regional Spot	Half	V—11942	**BIZNET, WTBS, Satellite Cinema**—News, variety,and movies—U.S.A.	N/A	32 dBW
GSTAR A1	103.0°W	16	East U.S. Regional Spot	Half	V—12155	**Showtime—West**—Movies, sports, and specials—U.S.A.	N/A	36 dBW

SATCOM

SATCOM F1R	139.0°W	8	N. America & Hawaii	Full	V-3860	**NBC—East**—U.S. live/taped network programming—U.S.A.	6.8 MHz S/C	N.A.: 23.5 dBW Hawaii: 26.5 dBW
SATCOM F1R	139.0°W	15	N. America & Hawaii	Full	V—4000	**Yonkers Horse Racing** Occasional U.S. horse racing —U.S.A.	6.8 MHz S/C	N.A.: 23.5 dBW Hawaii: 26.5 dBW
SATCOM F1R	139.0°W	24	North America & Hawaii	Full	H—4180	**Radio Televisione Italiana** Daily Italian news and sports feeds—U.S.A.	6.8 MHz S/C	N.A.: 23.5 dBW Hawaii: 26.5 dBW
SATCOM F3R	131.0°W	1	N. America & Hawaii Spot	Full	V-3720	**Nickelodeon—East** Children's programming—U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	2	N. America & Hawaii Spot	Full	V-3740	**PTL Satellite** Interdenominational family programming—U.S.A.	Stereo 5.58/5.76 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	3	North America	Full	V-3760	**TBN (Trinity Broadcasting Network)**—Family Christian Programming—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F3R	131.0°W	4	North America	Full	V-3780	**FNN (Financial News)/SCORE** Live business, financial, sports news and events—U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	5	N. America & Hawaii Spot	Full	V-3800	**Viewer's Choice**—First run movies on a pay-per-view basis—U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	6	N. America & Hawaii Spot	Full	V-3820	**SPN (Satellite Program Net.)** Movies, entertainment, and financial self help programs —U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	7	North America	Full	V-3840	**ESPN Blackout Network** Occasional sports programming—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F3R	131.0°W	8	North America	Full	V-3860	**CBN Cable Network** Family programming—U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	9	N. America & Hawaii	Full	V-3880	**USA Cable Network—West** Focusing on sports and special interest programming—U.S.A.	Stereo 5.58/5.76 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	10	N. America & Hawaii	Full	V-3900	**Showtime—West** Commercial-free movies, sports, and specials—U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26dBW
SATCOM F3R	131.0°W	11	North America	Full	V-3920	**MTV: Music Television** Advertiser-supported music videos—U.S.A.	Stereo 5.58/ 6.62 MHz S/C	28 dBW
SATCOM F3R	131.0°W	12	North America	Full	V-3940	**EWTN (Eternal Word TV Net.)** Catholic spiritual growth and family programming—U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	13	N. America & Hawaii Spot	Full	V-3960	**HBO (Home Box Office)** Movies, sports, and specials —U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	14	N. America & Hawaii Spot	Full	V-3980	**Open-Net** Public affairs programming on issues in North Carolina —U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW

SATCOM (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
SATCOM F3R	131.0°W	15	North America	Full	V-4000	**VH-1/Video Hits One** Advertiser-supported video music—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F3R	131.0°W	16	North America	Full	V-4020	**HTN (Home Theater Network)** Family programming including movies, specials, & travel —U.S.A.	Stereo 5.8/6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	16	North America	Full	V-4020	**TLC (The Learning Channel)** Learning programs & college credit courses for adults— U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	17	N. America & Hawaii Spot	Full	V-4040	**Lifetime** Programming about health, and self development—U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	18	N. America & Hawaii Spot	Full	V-4060	**Reuter Monitor Service** News & price retrieval in commodity and money markets —U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	18	N. America & Hawaii Spot	Full	V-4060	**NJT (National Jewish TV)** Family Jewish programming— U.S.A.	6.8 MHz S/C	N.A.: 26 dBW Hawaii: 26 dBW
SATCOM F3R	131.0°W	20	North America	Full	V-4100	**BET (Black Entertainment TV)** Black-oriented movies, specials and sports—U.S.A.	Stereo 5.58/5.76 MHz S/C	26 dBW
SATCOM F3R	131.0°W	21	North America	Full	V-4120	**The Weather Channel** Live, constantly updated national weather service— U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	22	North America	Full	V-4140	**MSN: The Information Channel** Weekly series on business, travel, and health—U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	22	North America	Full	V-4140	**HSN (Home Shopping Network)** Designed for shopping at via television—U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	22	North America	Full	V-4140	**USA Blackout Network** Programming used in place of blacked-out sporting events —U.S.A.	6.8 MHz S/C	26 dBW
SATCOM F3R	131.0°W	23	North America	Full	V-4160	**Cinemax—West** Commercial-free movies and specials—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F3R	131.0°W	24	North America	Full	V-4180	**A&E (Arts & Entertainment)** Distinctive entertainment from around the world— U.S.A.	Stereo 5.58/5.76 MHz S/C	26 dBW
SATCOM F4	83.0°W	1	North America	Full	V-3720	**HSN (Home Shopping Network)** Designed for shopping at home via television—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	2	North America	Full	H-3740	**Bravo** International films, performing arts, & cultural— U.S.A.	Stereo 5.8/6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	4	North America	Full	H-3780	**Nickelodeon—West** Designed for pre-school through teen-age audiences —U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	5	North America	Full	V-3800	**ABC—Affiliate Feeds** Occasional live/taped network feeds—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	6	North America	Full	H-3820	**BIZNET, The American Business Network** Business and public affairs programming—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	6	North America	Full	H-3820	**MSG (Madison Square Garden)** Sports and variety programming—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	7	North America	Full	V-3840	**NCN (National Christian Network)** Multi-denominational religious programs—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	9	North America	Full	V-3880	**SportsVision** Occasional regional sports from the Chicago area— U.S.A.	6.8 MHz S/C	28 dBW

SATCOM (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
SATCOM F4	83.0°W	10	North America	Full	H-3900	**AMC (American Movie Classics)** Covering movies made before 1970—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	11	North America	Full	V-3920	**HSE (Home Sports Entertainment)**—Regional sports service—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	12	North America	Full	H-3940	**The Playboy Channel** Adult-oriented game shows, music, specials, and films—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	12	North America	Full	H-3940	**The Heartbeat Network** Religious and family oriented programming—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	13	North America	Full	V-3960	**NESN (New England Sports)** Occasional regional service covering New England states —U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	14	North America	Full	H-3980	**HSE (Home Sports Entertainment)**— Occasional sports feeds—U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	14	North America	Full	V-3980	**Playboy Private Ticket** Occasional adult programming —U.S.A.	6.8 MHz S/C	28 dBW
SATCOM F4	83.0°W	15	North America	Full	H-4000	**SNL (Success-N-Life Network)** Educational, exercise, and variety Christian programs—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	16	North America	Full	V-4020	**The Silent Network** Programming in sign language and voice—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	18	North America	Full	V-4060	**Hit Video USA** Contemporary hit music videos—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	19	North America	Full	H-4080	**WPIX—New York** Family-oriented programming, movies and sports—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	20	North America	Full	V-4100	**Prime Ticket** Occasional nightly sports from the Los Angeles forum—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	21	North America	Full	H-4120	**The Nostalgia Channel** Movies, comedy, and variety programming—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	22	North America	Full	V-4140	**HTS (Home Team Sports)** Sports service from the capitol region—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F4	83.0°W	24	North America	Full	V-4180	**Nightline Television Network** Religious and variety programming—U.S.A.	6.8 MHz S/C	30 dBW
SATCOM F2R	72.0°W	13	North America	Full	V-3960	**NASA Contract Channel** Live NASA missions and related events—U.S.A.	6.8 MHz S/C	32 dBW
SATCOM F2R	72.0°W	20	North America	Full	H-4100	**AFRTS (American Forces Radio and TV)** Independent programming and network feeds—U.S.A.	6.8 MHz S/C	32 dBW

SBS

SBS 3	95.0°W	3	North America	Full	H-11823	**NBC—Affiliate feeds** Occasional live/taped network programming—U.S.A.	6.8 MHz S/C	27 dBW
SBS 3	95.0°W	5	North America	Full	H-19921	**NBC—West**—Live/taped network programming—U.S.A.	6.8 MHz S/C	27 dBW
SBS 3	95.0°W	6	North America	Full	H-11970	**NBC—Central**—Live/taped network programming—U.S.A.	6.8 MHz S/C	27 dBW
SBS 3	95.0°W	8	North America	Full	H-12068	**PSN (Private Satellite Net.)** Videoconferencing and private video feeds—U.S.A.	6.8 MHz S/C	27 dBW

SPACENET

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
SPACENET 1	120.0°W	11	N. America & Hawaii Spot	Full	H-3920	**HSN (Hospital Satellite Network)**—Medical programming and uplifting movies—U.S.A.	6.8 MHz S/C	N.A.: 25.2 dBW Hawaii: 25.2 dBW
SPACENET 1	120.0°W	15	N. America & Hawaii Spot	Full	H-4000	**ACTS (American Christian Television System)**—Family Christian Entertainment—U.S.A.	6.8 MHz S/C	N.A.: 25.2 dBW Hawaii: 25.2 dBW
SPACENET 1	120.0°W	21	N. America & Hawaii Spot	Full	H-4120	**VMT (Vanderbilt Medical Television)**—Medical programming for doctors and hospitals—U.S.A.	6.8 MHz S/C	N.A.: 25.2 dBW Hawaii: 25.2 dBW
SPACENET 1	120.0°W	21	N. America & Hawaii Spot	Full	H-4120	**BTN (Baptist Telecom. Net.)** Religious programming for churches—U.S.A.	6.8 MHz S/C	N.A.: 25.2 dBW Hawaii: 25.2 dBW

TELSTAR

TELSTAR 303	125.0°W	1	North America	Full	V-3720	**CMTV (Country Music TV)**—Country-oriented videos and programming—U.S.A.	Stereo 5.58/5.76 MHZ S/C	34.3 dBW
TELSTAR 303	125.0°W	2	N. America & Hawaii Spot	Full	H-3740	**SelecTV**—Feature films and adult movies—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Hawaii: 36.3 dBW
TELSTAR 303	125.0°W	18	N.America & Hawaii Spot	Full	H-4060	**American Extasy**—X-rated movies—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Hawaii: 36.3 dBW
TELSTAR 303	125.0°W	22	N. America & Hawaii Spot	Full	H-4140	**KTVT—Dallas**—Movies, sports, and variety programming—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Hawaii: 36.3 dBW
TELSTAR 301	96.0°W	2	N. America & Hawaii Spot	Full	H-3740	**CBS—Central**—Live/taped network programming—U.S.A.	6.8 MHz S/C	N.A.: 34.4 dBW Hawaii: 36.3 dBW
TELSTAR 301	96.0°W	9	North America	Full	V-3880	**Wold Communications**—News, sports, and variety programming—U.S.A.	6.8 MHz S/C	34.3 dBW
TELSTAR 301	96.0°W	10	N. America & Hawaii Spot	Full	H-3900	**ABC—Central**—Live/taped network programming—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Hawaii: 36.3 dBW
TELSTAR 301	96.0°W	12	N. America & Puerto Rico Spot	Full	H-3940	**ABC—Contract Channel**—Occasional live/taped network feeds—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Puerto Rico: 36.3 dBW
TELSTAR 301	96.0°W	23	N. America & Alaska Spot	Full	V-4160	**Wold Communications**—News sports, and variety programming—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Alaska: 36.3 dBW
TELSTAR 302	87.0°W	10	N. America & Hawaii Spot	Full	H-3900	**ABC—West**—Live/taped network programming—U.S.A.	6.8 MHz S/C	N.A.: 34.3 dBW Hawaii: 36.3 dBW
TELSTAR 302	87.0°W	16	N. America & Puerto Rico Spot	Full	H-4020	**CBS—West**—Live/taped network programming—U.S.A.	6.2 MHz S/C	N.A.: 34.3 dBW Puerto Rico: 36.3 dBW
TELSTAR 302	87.0°W	20	N. America & Puerto Rico Spot	Full	H-4100	**CBS—Central**—Live/taped network programming—U.S.A.	6.2 MHz S/C	N.A.: 34.3 dBW Puerto Rico: 36.3 dBW

WESTAR

WESTAR 5	122.5°W	2	North America	Full	V-3740	**The University Network (The Unchannel)**—Nonsecular programming with Dr. Gene Scott—U.S.A.	6.8 MHz S/C	29.75 dBW
WESTAR 5	122.5°W	7	North America & Hawaii	Full	V-3840	**CBS Contract Channel** Occasional live/taped network feeds-U.S.A.	6.2 MHz S/C	N.A.: 29.75 dBW Hawaii: 33.75 dBW
WESTAR 5	122.5°W	8	North America	Full	V-3860	**PASS (Pro Am Sports System)**—Sports from Michigan, Ohio, Indiana—U.S.A.	6.8 MHz S/C	29.75 dBW
WESTAR 5	122.5°W	20	North America	Full	V-4100	**Telebet Racing**—Occasional horse racing—U.S.A.	Compressed	29.75 dBW

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171° W TDRS C US-Spacecom
SCS 2 US-Space C (1987) 166° W
175° W VSS PH II (DBS) US-Dominion
COLSAT 2 US-Col C (1987) 147.5° W
178° W FINANSAT I
AURORA II US-Alaskom (1989) 146° W
WESTAR VII US Western Union (1990) 144° W
179° E INTELSAT IVA F3
AURORA I US-Alaskom 143 ° W
177.5° E MARECS B2A Inmarsat
GALAXY IV US-Hughes (1989) 140° W
176.5° E MARISAT F3 US-Comsat
176° E INTELSAT V (1986)
SATCOM F1R US-RCA 139° W
174° E INTELSAT IVA F6
SATCOM F3R US-RCA 131° W
136° W SPACENET 4 US-GTE/Spacenet (1989)
INTELSAT V (1987) 173° E
167° E PAPAU New Guinea Sat
ASC I US (1985) 128° W
145° E STATSIONAR 16 USSR (1987)
CSE Japan (1985) 150° E
TELSTAR 303 US-AT&T 125° W
134° W GALAXY I US-Hughes
GORIZONT 6 (STATSIONAR 7) USSR (1984) 140° E
136° E CS-2B Japan
132° E CS-3 Japan (1988)
122.5° W WESTAR V US-Western Union
STATSIONAR-15 USSR 128° E
125.9° E RADUGA 15 USSR
120° W SPACENET I US-GTE
125° E STW-1 China
116.5° W MORELOS F2 Mexico (1985)
PALAPA B3 Indonesia (1985) 118° E
114.7° E SAKURA (CS) Japan
113.5° W MORELOS F1 Mexico (1985)
PALAPA B2 Indonesia 113° E
108° E PALAPA B1 Indonesia
111.5° W ANIK D2 Canada-Telesat
BS-3A Japan (1989) 108° E
109° W ANIK B Canada-Telesat
GORIZONT 6 (STATSIONAR 14) USSR 95° E
104.5° W ANIK D1 Canada-Telesat
INSAT IC India (1986) 94° E
101° W FORDSAT I US-Ford Aerospace (1987)
GORIZONT 8 (STATSIONAR 6) USSR 90° E
101° W SBS IV US-SBS
GORIZONT 8 USSR 88.4° E
99° W WESTAR IV US Western Union
RADUGA 14 USSR 85° E
96° W TELSTAR 301 US-AT&T
PALAPA A01 Indonesia 83° E
93.5° W GALAXY III US-Hughes
RADUGA 12 USSR 82.7° E
93° W FORDSAT II US-Ford Aerospace (1987)
STATSIONAR 13 USSR 80° E
91° W WESTAR 6S US-Western Union (1985)
PALAPA A02 Indonesia 77° E
91° W WESTAR III US-Western Union
RADUGA 4 USSR 75.7° E
86° W TELSTAR 302 US-AT&T
INSAT IB India 74° E
85° W ARGENTINE SAT II Argentina
MARECS 2 Inmarsat 73° E
83° W STSC 1 Cuba (1988)
MARISAT F2 US-Comsat 72.5° E
83° W SATCOM F4 US-RCA
STW-2 China (1985) 70° E
83° W ASC II US (1988)
INTELSAT V (1985) 66 E°
80° W ARGENTINE SAT I Argentina
SIRIO Italy-CNR (1977) 65° E
MARECS 1 Inmarsat (1986) 64.5° E
79° W WESTAR III US-Western Union (1986)
INTELSAT V F5 63° E
INTELSAT V F7 60° E
76° W COMSTAR D3 US-AT&T
INTELSAT V F1 57° E
GORIZONT 9 (STATSIONAR 5)USSR 53° E
65° W BRAZILSAT A1 (SBTS A1) Brazil (1985)
STATSIONAR 12 USSR 40° E
45° E RADUGA 13 USSR
64° W ASC 3 & ASC 4 US-ASC (1987 1989)
GORIZONT 5 USSR 35 7° E
35.8° E RADUGA 9 USSR
62 W SATCOM F7 US RCA (1989)
31° W INTELSAT IVA F1
31° W UNISAT-1 U K (1989)
61° W TDRS B US-Spacecom (1985)
NAT SAT 1 Nigeria 20° E
35° E RADUGA 11 USSR (1982)
27.5° W INTELSAT VA F11
60° W INTELSAT IVA, V (1986)
26° W MARECS A Inmarsat
NAT SAT 2 Nigeria 16° E
26° E ARABSAT F2 Arab League (1985)
57° W PANAMSAT I US (1987)
25° W RADUGA 7 (STATSIONAR 8) USSR
19° E ARABSAT F1 Arab League
56° W INTELSAT IVA, V, VA (1987)
24.5° W INTELSAT VA F10
F-SAT 1 France (1987) 07° E
15° E AMS 1 & 2 Israel (1986)
23° W MARECS 2 Inmarsat
14° E NAT SAT 3 Nigeria
53° W INTELSAT V F8
03° E TELECOM F3 France (1985)
01° W INTELSAT V F2
67° W SATCOM F6 US-RCA (1986)
05° W TELECOM F2 France
69° W SPACENET II US-GTE
08° W TELECOM F1 France
70° W BRAZILSAT A2 (SBTS A2) Brazil (1985)
11° W GORIZONT 4 (STATSIONAR 11) USSR
72° W SATCOM F2R US-RCA
34.5° W INTELSAT V F4
74° W GALAXY II US-Hughes
40.5° W INTELSAT VB (1986)
14° W GORIZONT 7 (STATSIONAR 4) USSR
75° W SATCOL 1A & 1B Colombia
41° W TDRS A US-Spacecom
15° W MARISAT F1 US Com General (1976)
48° W FINANSAT II
16.5° W INTELSAT V (1986)
50° W INTELSAT IV F1
18.5° W INTELSAT V F6 MCS-B
21.5° W INTELSAT IVA F4

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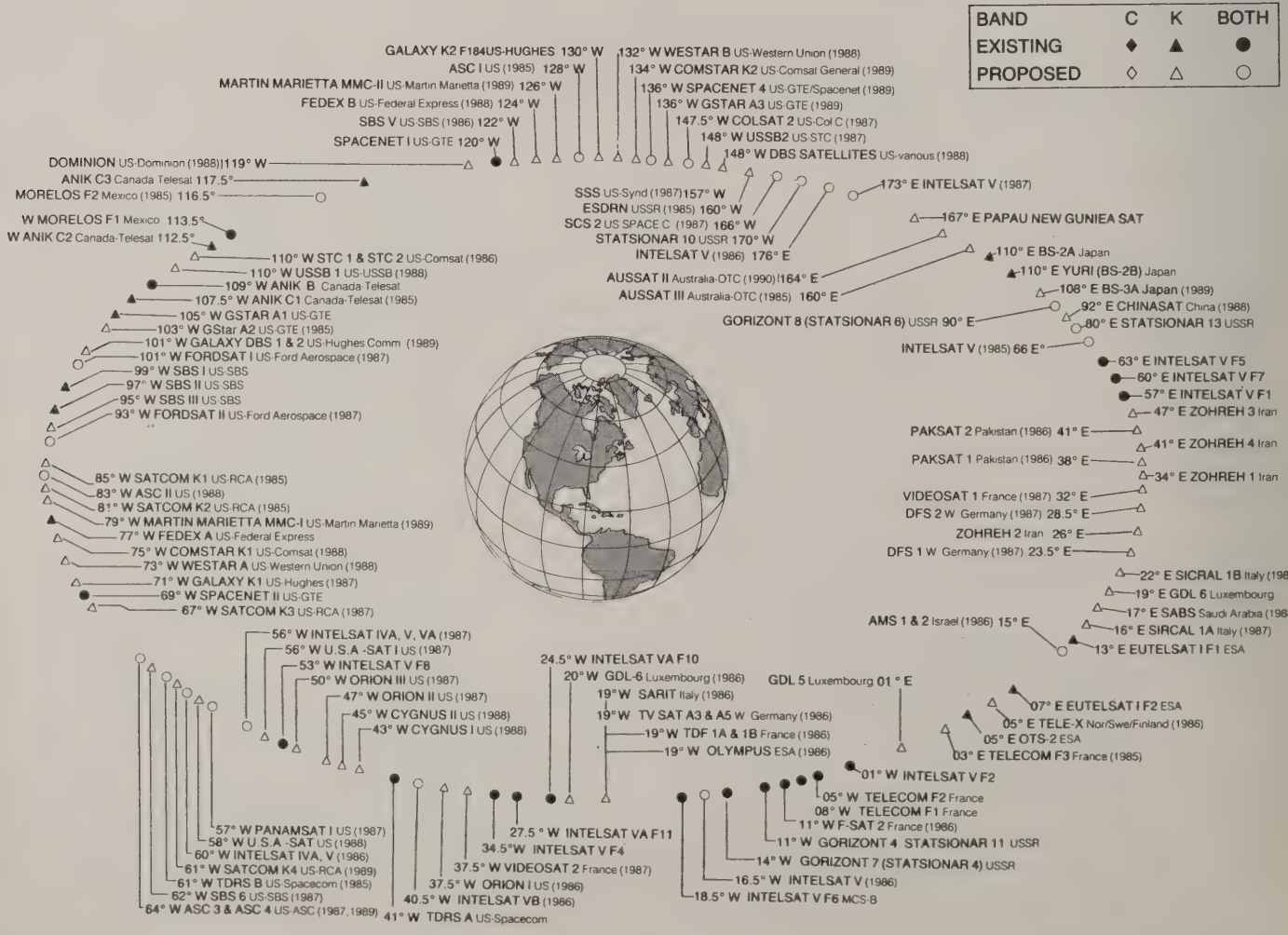
KU-BAND GEOSYNCHRONOUS SATELLITES

Keep up to date with the latest development in Ku-band satellite systems around the world, including GDL/Coronet, ECS, SBS, I, II, and III, the Aniks, and PanAmSat, *Satellite World* features Ku-band equipment reviews, discusses the pros and cons of true DBS service, and examines volatile issues such as how signal spillover might influence cultural makeups.


BAND C K BOTH
EXISTING ♦ ▲ ●
PROPOSED ◊ △ ○
GALAXY K2 F184US-HUGHES 130° W
ASC I US (1985) 128° W
MARTIN MARIETTA MMC-II US-Martin Marietta (1989) 126° W
FEDEX B US-Federal Express (1988) 124° W
SBS V US-SBS (1986) 122° W
SPACENET I US-GTE 120° W
DOMINION US-Dominion (1988)|119° W
ANIK C3 Canada Telesat 117.5°
MORELOS F2 Mexico (1985) 116.5°
W MORELOS F1 Mexico 113.5°
W ANIK C2 Canada-Telesat 112.5°
110° W STC 1 & STC 2 US-Comsat (1986)
110° W USSB 1 US-USSB (1988)
109° W ANIK B Canada-Telesat
107.5° W ANIK C1 Canada-Telesat (1985)
105° W GSTAR A1 US-GTE
103° W GStar A2 US-GTE (1985)
101° W GALAXY DBS 1 & 2 US-Hughes Comm (1989)
101° W FORDSAT I US-Ford Aerospace (1987)
99° W SBS I US-SBS
97° W SBS II US-SBS
95° W SBS III US-SBS
93° W FORDSAT II US-Ford Aerospace (1987)
85° W SATCOM K1 US-RCA (1985)
83° W ASC II US (1988)
81° W SATCOM K2 US-RCA (1985)
79° W MARTIN MARIETTA MMC-I US-Martin Marietta (1989)
77° W FEDEX A US-Federal Express
75° W COMSTAR K1 US-Comsat (1988)
73° W WESTAR A US-Western Union (1988)
71° W GALAXY K1 US-Hughes (1987)
69° W SPACENET II US-GTE
67° W SATCOM K3 US-RCA (1987)
64° W ASC 3 & ASC 4 US-ASC (1987,1989)
62° W SBS 6 US-SBS (1987)
61° W TDRS B US-Spacecom (1985)
61° W SATCOM K4 US-RCA (1989)
60° W INTELSAT IVA, V (1986)
58° W U.S.A -SAT US (1988)
57° W PANAMSAT I US (1987)
56° W INTELSAT IVA, V, VA (1987)
56° W U.S.A -SAT I US (1987)
53° W INTELSAT V F8
50° W ORION III US (1987)
47° W ORION II US (1987)
45° W CYGNUS II US (1988)
43° W CYGNUS I US (1988)
41° W TDRS A US-Spacecom
40.5° W INTELSAT VB (1986)
37.5° W ORION I US (1986)
37.5° W VIDEOSAT 2 France (1987)
34.5°W INTELSAT V F4
27.5 ° W INTELSAT VA F11
24.5° W INTELSAT VA F10
20° W GDL-6 Luxembourg (1986)
19°W SARIT Italy (1986)
19°W TV SAT A3 & A5 W Germany (1986)
19°W TDF 1A & 1B France (1986)
19° W OLYMPUS ESA (1986)
18.5° W INTELSAT V F6 MCS-B
16.5° W INTELSAT V (1986)
14° W GORIZONT 7 (STATSIONAR 4) USSR
11° W GORIZONT 4 STATSIONAR 11 USSR
11° W F-SAT 2 France (1986)
08° W TELECOM F1 France
05° W TELECOM F2 France
01° W INTELSAT V F2
GDL 5 Luxembourg 01 ° E
03° E TELECOM F3 France (1985)
05° E OTS-2 ESA
05° E TELE-X Nor/Swe/Finland (1986)
07° E EUTELSAT I F2 ESA
AMS 1 & 2 Israel (1986) 15° E
13° E EUTELSAT I F1 ESA
16° E SIRCAL 1A Italy (1987)
17° E SABS Saudi Arabia (1988)
19° E GDL 6 Luxembourg
22° E SICRAL 1B Italy (1987)
VIDEOSAT 1 France (1987) 32° E
DFS 2 W Germany (1987) 28.5° E
ZOHREH 2 Iran 26° E
DFS 1 W Germany (1987) 23.5° E
PAKSAT 2 Pakistan (1986) 41° E
PAKSAT 1 Pakistan (1986) 38° E
41° E ZOHREH 4 Iran
34° E ZOHREH 1 Iran
INTELSAT V (1985) 66 E°
63° E INTELSAT V F5
60° E INTELSAT V F7
57° E INTELSAT V F1
47° E ZOHREH 3 Iran
GORIZONT 8 (STATSIONAR 6) USSR 90° E
AUSSAT II Australia-OTC (1990)|164° E
AUSSAT III Australia-OTC (1985) 160° E
SSS US-Synd (1987)157° W
ESDRN USSR (1985) 160° W
SCS 2 US SPACE C (1987) 166° W
STATSIONAR 10 USSR 170° W
INTELSAT V (1986) 176° E
173° E INTELSAT V (1987)
167° E PAPAU NEW GUNIEA SAT
110° E BS-2A Japan
110° E YURI (BS-2B) Japan
108° E BS-3A Japan (1989)
92° E CHINASAT China (1988)
80° E STATSIONAR 13 USSR

WESTAR (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
WESTAR 5	122.5°W	24	North America	Full	V-4180	**The FUN Channel**—XXX-rated adult entertainment—U.S.A.	Compressed	29.75 dBW
WESTAR 5	122.5°W	24	North America	Full	V-4180	**PPV—The Pay-Per-View Channel**—Adult movies, other films and sporting events on a pay-per-view basis—U.S.A.	Compressed	29.75 dBW
WESTAR 4	99.0°W	6	North America	Full	V-3820	**Atlantic City Horse Racing**—Occasional live horse racing—U.S.A.	Compressed	29.75 dBW
WESTAR 4	99.0°W	6	North America	Full	V-3820	**Word of Faith Satellite Network**—Occasional interdenominational family programming—U.S.A.	6.8 MHz S/C	29.75 dBW
WESTAR 4	99.0°W	11	North America & Hawaii	Full	H-3920	**CTNA (Catholic Telecommunications Network of America)** Family Christian programming—U.S.A.	6.8 MHz S/C	N.A.: 29.75 dBW Hawaii: 33.75 dBW
WESTAR 4	99.0°W	15	North America & Hawaii	Full	H-4000	**PBS (Public Broadcasting Service)**—Educational programming—U.S.A.	6.8 MHz S/C	N.A.: 29.75 dBW Hawaii: 33.75 dBW
WESTAR 4	99.0°W	16	North America	Full	V-4020	**CNN (Cable News Network)** Occasional incoming regional bureau news feeds.	6.8 MHz S/C	29.75 dBW
WESTAR 4	99.0°W	17	North America & Hawaii	Full	H-4040	**PBS (Public Broadcasting Service)**—Educational programming—U.S.A.	6.8 MHz S/C	N.A.: 29.75 dBW Hawaii: 33.75 dBW
WESTAR 4	99.0°W	20	North America	Full	V-4100	**ABC—Contract Channel** Occasional live/taped network programming—U.S.A.	6.8 MHz S/C	29.75 dBW
WESTAR 4	99.0°W	21	North America & Hawaii	Full	H-4120	**PBS (Public Broadcasting Service)**—Educational programming—U.S.A.	6.8 MHz S/C	N.A.: 29.75 dBW Hawaii: 33.75 dBW
WESTAR 4	99.0°W	23	North America & Hawaii	Full	H-4160	**PBS (Public Broadcasting Service)**—Educational programming—U.S.A	6.8 MHz S/C	N.A.: 29.75 dBW Hawaii: 33.75
WESTAR 3	91.0°W	7	North America	Full	H-3800	**CNN (Cable News Network)** Occasional incoming regional bureau news feeds—U.S.A.	6.2 MHz S/C	30 dBW
WESTAR 3	91.0°W	19	North America	Full	H-4080	**BrightStar International**—Occasional international news feeds—U.S.A.	6.8 MHz S/C	30 dBW
WESTAR 3	91.0°W	21	North America	Full	H-4120	**TIN(The Independent Network)** Occasional national news for independent stations—U.S.A.	6.8 MHz S/C	30 dBW

INTELSAT V

I-V—F08	53.0 W	18	Global Beam	Half	RH-4065	**Denmark SCPC**—Radio Denmark	4049.625 MHz	20 dBW
I-V—F08	53.0 W	22	Global Beam	Half	RH-4135	**TV Chile, Channel 7, Santiago, Chile**	SCPC	19 dBW
I-V—F04	34.5 W	24	Global Beam	Half/Full	RH-4177.5	**International Video News Feed**	6.6 MHz S/C	Varies 17 – 24 dBW
I-V—F06	18.5 W	24	Global Beam	Half/Full	RH-4177.5	**Occasional Video**—Major international news feeds	6.6 MHz S/C	Varies 17 – 24 dBW
I-V—F02	1.0 W	7	Global Beam	Full	RH-3845	**Norway**	Non-video lease	—
I-V—F02	1.0 W	18	Global Beam	Half	RH-4065	**BrightStar**—Independent international satellite system providing video services between USA and UK	6.625 MHz S/C	18 dBW
I-V-F02	1.0 W	19	Global Beam	Full	RH-4085	**Portugal TV**	6.6 MHz S/C	18 dBW
I-V-F02	1.0 W	24	Global Beam	Full	RH-4175	**American Forces Radio and Television Service**—Provides live American programming to servicemen abroad.	6.8 MHz S/C	20 dBW

INTELSAT VA

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
I-VA—F11	27.5 W	1	West Hemi	Half	RH-3725	**Inravision, Channel 1**—Bogota, Colombia	SCPC on tr. 9	22 dBW
I-VA—F11	27.5 W	3	West Hemi	Half	RH-3765	**Radio Y Television Peruana, Channel 7**—Lima, Peru, and Cadena 1 TV from Bogota, Colombia	6.6 MHz S/C and/or SCPC	24 dBW
I-VA—F11	27.5 W	5	West Hemi	Full	RH-3825	**Venezolana de Television Caracas**—Entertainment programming and coverage of Latin America affairs	6.2 MHz S/C	26 dBW
I-VA—F11	27.5 W	9	West Hemi	Half	RH-3885	**Colombia**—TV Audio	3867 MHz/ SCPC transponder	—
I-VA—F11	27.5 W	20	Global Beam	Half	RH-4095	**Argentina**	Non-video lease	—
I-VA—F11	27.5 W	24	Global Beam	Full	RH-4055	**Argentina Televisora Color (ATC), Channel 7, Buenos Aires**—South American service	6.4 MHz S/C	23 dBW

TELECOM F1

TELECOM F1	8.0W	1	Semi-Global	Full	LH-3710	**AITV, Agence d'Images Television Francaise, News**—Paris	6.6 MHz S/C	24 dBW
TELECOM F1	8.0W	4	Spot Beam	Full	LH-3780	**Non-video TDMA telephony**	—	—

GORIZONT

GORIZONT 7	14.0 W	1	Spot Beam	Full	RH-3675	**I Programma**—Soviet Television, Moscow	7.0 MHz S/C with companding	22 dBW
GORIZONT 7	14.0 W	1	Global Beam	Full	RH-3725	**Occasional Video**	7.5 MHz S/C	28 dBW
GORIZONT 7	14.0 W	4	North Hemi	Full	RH-3775	**Non-video SCPC**—Radio Moscow	3778.975 MHz	—
GORIZONT 7	14.0 W	6	Global Beam	Full	RH-3825	**Intersputnik and O.I.R.T. TV program exchanges**	7.5 MHz S/C	28 dBW
GORIZONT 7	14.0 W	9	North Hemi	Full	RH-3875	**Non-video wideband digital signals**	—	—
GORIZONT 7	14.0 W	11	North Hemi	Full	RH-3925	**Non-video narrowband digital signals**	—	—

BRAZILSAT A1

SBTS A01	65.0 W	1	Spot Beam	Full	H-3720	**Rede Globo Network, Rio de Janeiro**—Portuguese-language Brazilian and American entertainment and sports	S/C	32 dBW
SBTS A01	65.0 W	2	Spot Beam	Full	V-3740	**SBT-TV, Rio de Janeiro**—Portuguese-language Brazilian entertainment and sports	S/C	32 dBW

BRAZILSAT A1 (cont.)

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
SBTS A01	65.0 W	5	Spot Beam	Full	H-3800	**Bandeirantes TV, Sao Paulo**—Portuguese-language Brazilian and American entertainment and sports	S/C	32 dBW
SBTS A01	65.0 W	6	Spot Beam	Full	V-3820	**Manchete TV (1986)**	S/C	32 dBW
SBTS A01	65.0 W	15	Spot Beam	Full	H-4000	**Embratel-Brazil**—Occasional video news and sports feeds	S/C	32 dBW
SBTS A01	65.0 W	24	Spot Beam	Full	V-4180	**EBT-TV**—Brazilian Educational TV Service	S/C	32 dBW

MORELOS F1

MORELOS F1	113.0 W	12	Spot Beam	Full	V-3948.75	**XEW-TV**—Mexico City	6.2 MHz S/C	—
MORELOS F1	113.0 W	14	Spot Beam	Full	V-3988.75	**XHITM-TV**—Mexico City	6.2 MHz S/C	—
MORELOS F1	113.0 W	22	Spot Beam	Full	V-4148.75	**XHDF-TV**—Mexico City	6.2 MHz S/C	—
MORELOS F1	113.0 W	24	Spot Beam	Full	V-4188.75	**XETV**—Tijuana/San Diego	6.2 MHz S/C	—

Satellite Services
Indian & Pacific Ocean Regions

INTELSAT IVA

I-IVA—F06	174.0 E	24	Global Beam	Full	RH-4175	**International News and Sports Feeds**	—	17 dBW

INTELSAT V

I-V—F05	63.0 E	24	Global Beam	Half/Full	RH-4177.5	**Occasional Video**—Regular news feeds between Europe and Australia	6.6 MHz S/C	—
I-V—F07	66.0 E	8	East Hemi	Full	RH-3855	**RTM-TV**—Malaysia	6.6 MHz S/C	—
I-V—F07	66.0 E	10	East Hemi	Full	RH-3905	**TV Shanghai**—China	6.6 MHz S/C	—
I-V—F07	66.0 E	16	East Hemi	Quarter	RH-3995	**Thailand**—Non-video lease	—	—
I-V—F07	66.0 E	20	Global Beam	Full	RH-4095	**Oman Television**	SCPC	19 dBW
I-V—F07	66.0 E	24	Global Beam	Half/Full	RH-4177.5	**International News and Sports Feeds**	6.6 MHz S/C	—
I-V—F08	179.0 E	6	West Hemi	Half	RH-3815	**CNN and NBC**—Los Angeles	5.3 MHz	23 dBW
I-V—F08	179.0 E	7	West Hemi	Half	RH-3835	**CBS and ABC**—Los Angeles	5.70 and 5.95 MHz	23 dBW
I-V—F08	179.0 E	18	West Hemi	Full	RH-4015	**JISO**—Japan	—	—
I-V—F08	179.0 E	23	West Hemi	Full	RH-4155	**American Forces Radio and Television Service**—Provides live American programming to servicemen abroad	6.8 MHz	26 dBW

GORIZONT

Satellite	Location	Tr.#	Tr. Beam	Tr. Type	Polarization/ Center Frequency	Service Description/Country	Audio Info	Estimated Beam-Edge EIRP
GORIZONT 9	53.0 E	–1	Spot Beam	Full	RH-3675	**I Programma**—Soviet Television, Moscow (Orbita-4 version)	7.0 MHz Audio S/C	—
GORIZONT 9	53.0 E	9	North Hemi	Full	RH-3875	**II Programma**—Soviet Television, Moscow (Orbita-4 version)	Sound-in-sync	—
GORIZONT 10	80.0 E	–1	Spot Beam	Full	RH-3675	**II Programma**—Soviet Television, Moscow (Orbita-4 version)	7.5 MHz S/C	—
GORIZONT 10	80.0 E	9	North Hemi	Full	RH-3875	**I Programma**—Soviet Television, Moscow (Orbita-4 version)	Sound-in-sync	—
GORIZONT 8	90.0 E	–1	Spot Beam	Full	RH-3675	**II Programma**—Soviet Television, Siberian edition (Orbita-2 version)	7.0 MHz Audio S/C	—
GORIZONT 8	90.0 E	9	North Hemi	Full	RH-3875	**I Programma**—Soviet Television, Moscow (Orbita-2 version)	Sound-in-sync	—
GORIZONT 6	140.0 E	–1	Spot Beam	Full	RH-3675	**II Programma**—Soviet Television, Moscow (Orbita-1 version)	7.0 MHz Audio S/C	—
GORIZONT 6	140.0 E	9	North Hemi	Full	RH-3875	**I Programma**—Soviet Television, Moscow (Orbita-1 version)	Sound-in-sync	—

ARABSAT

ARABSAT 1-B	26.0 E	23	Spot Beam	Full	RH-4125	**Occasional Video**	6.6 MHz S/C	—
ARABSAT 1-B	26.0 E	S*	Spot Beam	Full	LP-2634	**Channel 5 Riyadh**—Saudi Arabia	6.6 MHz S/C	—

PALAPA B1

PALAPA B01	108.0E	8	Spot Beam	Full	V-3860	**TBS 7 TV**—Bangkok, Thailand	SCPC	—
PALAPA B01	108.0E	10	Spot Beam	Full	V-3900	**RTM 1 (Warna 1) TV**—Kuala Lumpur, Malaysia	6.5 MHz S/C	—
PALAPA B01	108.0E	12	Spot Beam	Full	V-3940	**Army Channel 5 TV**—Bangkok, Thailand	SCPC	—
PALAPA B01	108.0E	15	Spot Beam	Full	H-4000	**TVI-TV**—Indonesia	6.5 MHz S/C	—

YURI

YURI BSE-02	110.0 E	13	Yuri Spot Beam	Full	RH-11.91928	**NHK-TV Tokyo**— PCM digital transmissions	—	—

INSAT

INSAT 1-B	74.0 E	24	Spot Beam	Full	LP-4180	**TV India/Occasional Video**	S/C	—
INSAT 1-B	74.0 E	S*	Spot Beam	Full	LP-2575	**TV India**	—	—
INSAT 1-B	74.0 E	S*	Spot Beam	Full	LP-2615	**TV India**	—	—

RH = right-hand circular polarization **LH** = left-hand circular polarization **H** = horizontal polarization * S-band transponders between 2.50 – 2.69 GHz

(continued from page 15)
first TDF, Luxembourg's first SES/GDL, and West Germany's first TV Sat. The four authorized 1A services, meanwhile, could lease medium-power Telecom F1 and F2 transponders for the interim if France relaxes its telephony-only Telecom policy as anticipated at press time.

U.S.-based EG&G has received a three-year, $360 million extension from the U.S. National Aeronautics and Space Administration (NASA) on its contract to manage the John F. Kennedy Space Center in Florida, U.S.A.. EG&G, which has managed the facility since 1983, says the extension is part of a potential 10-year contract.

EG&G also makes instruments and supplies services such as nuclear test monitoring to the U.S. government. The EG&G Florida Inc. unit is responsible for computers, instrument calibration, security, health and safety, and other operations at Kennedy.

RCA Corp. will become part of U.S.-based General Electric Co. (GE) after a planned $6.28 billion acquisition is completed in September 1986. GE is not related to U.K.-based General Electric Co. (GEC).

General Motors Corp. (GM), by comparison, will pay about $5 billion and trade 50 million new shares of Class H GM stock for the Hughes Aircraft Co. if GM stockholders approve (see "World Watch," January 1986). Both RCA and Hughes manufacture telecommunications satellites. Each also has a division—RCA Americom and Hughes Communications Galaxy Inc.—that owns and operates satellites with domestic U.S. footprints.

RCA reported a net income of $341 million on revenues of $10.1 billion in 1984. About 40 percent of the new company's total earnings will be generated by high-technology products and services after the RCA purchase is completed, according to Wall Street investment analysts.

GE's purchase of RCA will not affect the management or program content of RCA's National Broadcasting Co. (NBC) unit, according to top NBC executives. NBC, one of the three major U.S. television networks, had been talking about starting a cable news service to compete with Turner Broadcasting Systems's (TBS) Cable News Network (CNN).

"This is going to be one dynamite company," says John F. Welch Jr., GE's chairman and chief executive officer. The U.S. Securites and Exchange Commission (SEC) is already investigating an "explosive" jump in the value of the large volume of RCA stock that changed hands just before the GE takeover was announced. The basic purchase agreement was reportedly arranged in just six days.

RCA American Communications Inc. (RCA Americom), a subsidiary of U.S.-based RCA Corp., and Home Box Office Inc. (HBO), a cable programming subsidiary of U.S.-based Time Inc., have agreed to jointly acquire Satcom K3, a 16-transponder RCA-built Ku-band satellite to be stationed at 67 degrees west and scheduled for a late 1988 launch.

Time is the head of a five-company group that plans to purchase the 2.1 million-subscriber Group W unit, the third largest U.S. multiple cable systems operator (MSO), for $1.6 billion and about $400 to $500 million in assumed debts. Group W is a subsidiary of U.S.-based Westinghouse Electric Corp. U.S.-based General Electric Corp. (GE) plans to purchase RCA Corp. for about $6 billion later this year.

HBO will lease four interim transponders from RCA Americom on RCA's Satcom K1; RCA Service Co. will lease one K1 transponder to provide programming to the U.S. lodging industry. RCA Service Co. plans to use two K3 transponders, and the remaining 14 will be used to distribute cable programming, according to RCA Corp. Time and RCA are apparently positioning themselves for an expected shift of U.S. cable services and network feeds from C- to Ku-band distribution satellites. RCA's K-series satellites are equipped with 47-watt transponders that could be received by dishes as small as .75 meters (2.5 feet) in prime coverage areas of the United States.

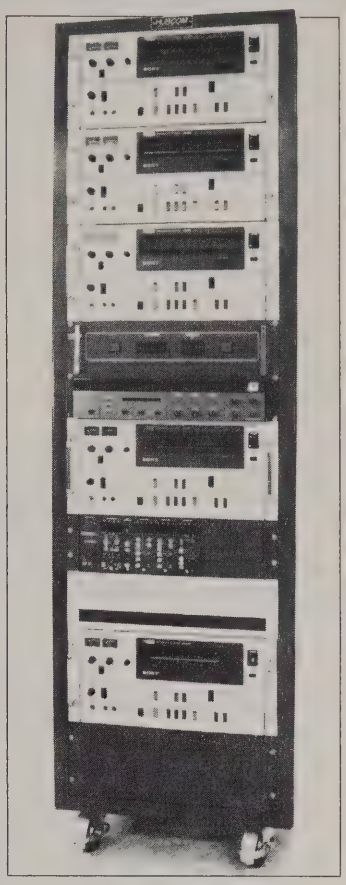
RCA Americom is already marketing its excess domestic U.S. C-band capacity "by the slice" at $18,000 a month for each 10 percent of a fully protected service 36-MHz transponder, and $12,000 a month for transponder-failure protected 3.6-Mhz slices. "This fractional transponder service is directed to customers primarily wishing to connect operational centers for private networking," according to Andrew T. Hospodor, president and chief executive officer of RCA Americom. U.S. teleports—fixed uplink and downlink dish farms with blanket Federal Communications Commission (FCC) authorization—are also likely C-band lessees.

HARDWARE

A 800-MHz bandwidth Ku-band waveguide filter with UBR-120 flanges is now available from Huber & Suhner. The filter has a center frequency of 11.325 GHz and can be used to eliminate out-of-band interference. Two versions, one straight and the other with a 90-degree bend, are available. For more information, contact: Huber & Suhner Ltd., RF and Microwave Division, 9100 Herisau, Switzerland. Telephone 071 53 15 15.

The HR-1000 950- to 1450-MHz block downconversion receiver from Pico has front panel control or infrared keypad remote control, 5- to 8-MHz audio subcarrier tuning, and 70-MHz intermediate frequency (IF) loop-through. The TVRO receiver accepts 60 Hz 105- to 130-volt AC power and is descrambler compatible, according to the manufacturer. For more information, contact: Pico Products Inc., Home Satellite Division, 103 Commerce Boulevard, Liverpool, NY 13088, U.S.A. Telephone (315) 451-7700.

Mitsubishi Electric Corp. has introduced a low-cost, large-scale integration (LCI) microprocessor chip that can generate up to 64 six-by-nine-dot grid information display characters, including complex Kanji Chinese characters, on television screens. The characters can be varied vertically and horizontally in four steps. The complementary metal oxide semiconductor (CMOS) is housed in a 22-pin plastic mold, dual in-line (DIL) package. Some 200,000 of the chips will be manufactured per month, according to Mitsubishi. For more information, contact: Mitsubishi Electric Sales America Inc., 5757 Plaza Drive, P.O. Box 6007, Cypress, CA 90630-0007 U.S.A. Telephone (714) 220-2500.



HubCom's HCD-500 system

The HCD-500 television program delay system from Hubbard Communications Inc. can be used to delay the rebroadcast of incoming satellite-delivered programming from three minutes to two hours. The unit incorporates the field-tested electronics of HubCom's HCC-55 Cart System, according to the manufacturer. Program delay times are selected by front-panel thumbwheel switches and the system functions automatically after the start button is pushed. For more information, contact: Hubbard Communications Inc., 12495 34th Street North, St. Petersburg, FL 33702, U.S.A. Telephone (813) 577-7759.

The SAVP model number 5983 surface acoustic wave (SAW) filtered aural/visual processor from Blonder-Tongue can be used to insert off-the-air VHF and UHF channels into cable and satellite master antenna television (SMATV) systems. The SAVP can accept BTSC (MTS) standard composite stereo signals and is equipped with dual SAW filters that typically provide 70 dB of adjacent channel separation, according to the manufacturer. For more information, contact: Blonder-

Tongue Laboratories Inc., One Jake Brown Road, Old Bridge, NJ 08857, U.S.A. Telephone (201) 679-4000.

The new dual C- and Ku-band feed system from Miralite is designed to maximize Ku-band performance. The "Multi-band's" 12-GHz feedhorn is mounted at the antenna's prime focus and the 4-GHz feed is slightly offset to one side. C-band loss is less than 0.5 dB and the dual-band unit will work with any antenna in the 0.3 to 0.379 F/D range, according to the manufacturer. C- and Ku-band orthomode, linear, and polarity-switching feed adapters for the unit are also available from Miralite. For more information, contact: Miralite Corp., 4050 Chandler, Santa Ana, CA 92704, U.S.A. Telephone (714) 641-7000.

The S-367 Burst Mode Link Analyzer (BMLA), a nondisruptive instrument designed to automatically measure time division multiple access (TDMA) signal amplitude and group delay intervals across an on-line TDMA transponder's frequency bandwidth, is now available from Signatron, a unit of the Sundstrand Corp. The transmitting BMLA uses the network's start of transmit frame (SOTF) synchronization signal and an operator-entered delay to position a burst in a vacant slot within the TDMA frame. Multiple measurements are averaged and then passed back to the transmitting BMLA over a telephone channel for display. The keypad-controlled unit uses an internal 16-bit microprocessor and does not interfere with network traffic, according to the manufacturer. Model S-367 is designed for use with 120-MB/s Intelsat TDMA systems; other versions, designed for 60-MB/s networks, are available. For more information, contact: Sundstrand Data Control Corporation, Overlake Industrial Park, Redmond, WA 98052, U.S.A. Telephone (206) 885-3711.

The ST910, ST1010, and ST2010 receivers from Anderson Scientific are now available with a factory-installed 12-volt DC power option. A back-panel toggle switch allows the receiver to accept power from an external DC power supply instead of DC power from the AC power transformer. For more information, contact: Anderson Scientific, 2693 Commerce Road, Rapid City, SD 57702, U.S.A. Telephone (605) 341-3781.

Cable operators interested in Hughes Aircraft Co. microwave products for the community antenna television (CATV) industry can now obtain a complete catalog. For more information, contact: Hughes Microwave Products Division, P.O. Box 2940, Torrance, CA 90509-2940 U.S.A. Telephone (213) 414-6304.

The Model 8526 digital set-top terminal from Scientific-Atlanta (S-A) designed for 550-MHZ cable television systems. The unit eliminates the need for a custom-configured programmable read-only memory chip (PROM); programming authorizations can be input by a company serviceperson through the unit's infrared remote control receiver. For more information, contact: Scientific-Atlanta Inc., One Technology Parkway, Box 105600, Atlanta, GA 30348, U.S.A. Telephone (404) 441-4000.

The Model 6825 signal distribution amplifier from Scientific-Atlanta (S-A) is designed for use with cable and satellite master antenna television (SMATV) systems. The 115 V/AC outlet-powered unit, encased in a finned aluminum heat-dissipating enclosure, is designed for easy indoor installation and is available in 15-, 22-, 30-, and 32-dB gain versions, according to S-A. For more information, contact: Scientific-Atlanta Inc., One Technology Parkway, Box 105600, Atlanta, GA 30348, U.S.A. Telephone (404) 441-4000.

A new 22-page catalog of surface acoustic wave (SAW) oscillators, filters, and dispersive delay lines is now available from Marconi. For more information, contact: Marconi Electronic Devices, Microwave Division, Doddington Road, Lincoln LN6 3LF, U.K.; or Epsilon Lambda Electronics Corporation, 427 Steven Street, Geneva, IL 60134, U.S.A.

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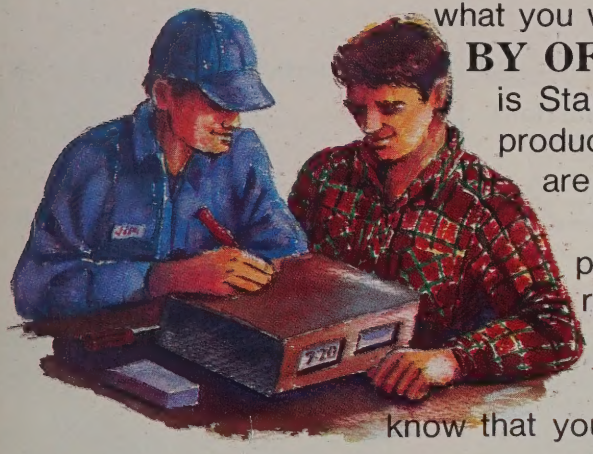

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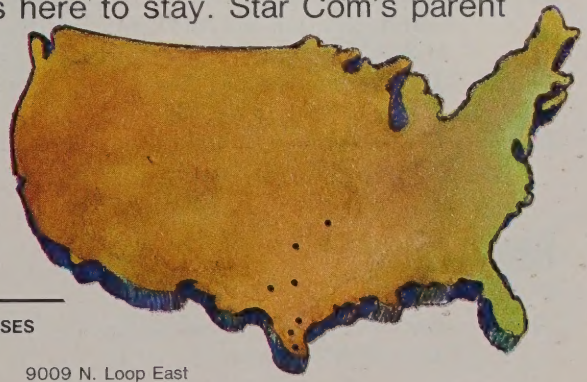

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4 – 7 **MexCom II**—Communications conference and exhibition, Guadalajara, Mexico.
11 – 13 **EuroCast '86**—European cable and satellite television exhibition and conference, Basel, Switzerland.
19 – 21 **SPACE/STTI**—Conference and exhibition, Las Vegas, Nevada, U.S.A.

March

4 – 6 **Business Telecom '86**—Conference, Barbicon Centre, London, England.
18 – 20 **ATUG '86**—Telecommunications conference and exhibition, Hilton International, Melbourne, Australia.

April

2 – 5 **Communications Tokyo '86**—Exhibition, Tokyo International Fairgrounds, Tokyo, Japan.
7 – 10 **SPONCOM**—Conference on corporate sponsorship of special programming, Cannes, France.
27 – 30 **Houston Space and Telecom Symposium**—Houston, Texas, U.S.A.

May

14 – 18 **Space Tech '86**—Conference and exhibition, Intercontinental Hotel, Geneva, Switzerland.

June

9 – 11 **Andean Expo**—Communications conference and exhibition, Quito, Equador.
10 – 13 **VenCom**—Communications conference and exhibition, Caracas, Venezuela.
22 – 25 **CTAM '86**—Annual conference of the U.S. Cable Television Administration and Marketing Society, Boston, Massachusetts, U.S.A.
24 – 27 **Telecommunications '86**—Conference and exhibition, U.S. Trade Center, Mexico City, Mexico.
24 – 28 **Broadcast '86**—International trade fair for film, radio and television. Frankfurt, West Germany.

September

9 – 11 **CaribeCom**—Communications conference and exhibition, San Juan, Puerto Rico.

December

3 – 4 **Com/Argentina**—Communications conference and exhibition, Buenos Aires, Argentina.

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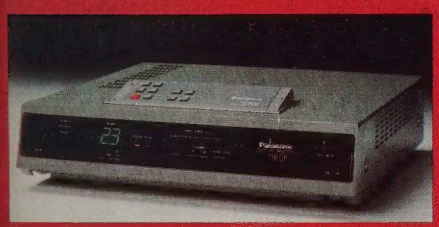

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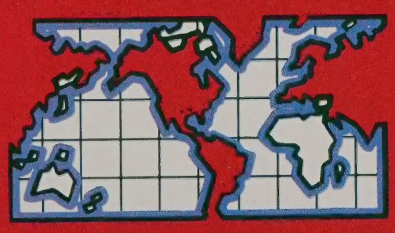

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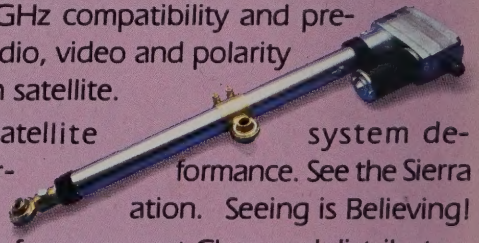

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